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EXPERIMENT STATION RECORD

VOL. 75 JULY 1936 No. 1

REGIONAL RESEARCH LABORATORIES UNDER THE BANKHEAD-JONES ACT

An important provision of the Bankhead-Jones Act (E. S. R., 73, p. 289) deals with the establishment and operation of regional research laboratories. These laboratories are to be set up by the Secretary of Agriculture in the major agricultural regions, and under their jurisdiction research supplementing that otherwise provided for may be conducted "into laws and principles underlying basic problems of agriculture in its broadest aspects; research relating to the improvement of the quality of, and the development of new and improved methods of production of, distribution of, and new and extended uses and markets for, agricultural commodities and by-products and manufactures thereof; and research relating to the conservation, development, and use of land and water resources for agricultural purposes."

The act further prescribes that one-half the special research fund which it allots to the Department must be used for these regional laboratories. For the fiscal year ended June 30, 1936, this fund consisted, under an interpretation by the Comptroller General, of that portion of $400,000 remaining after the deduction of not to exceed 2 percent for the administration of the Bankhead-Jones allotments to the State experiment stations, or, in other words, of at least $392,000. The amount available for the regional laboratories was therefore approximately $196,000. For the ensuing year, if the law remains unaltered, there will be $392,000, for 1938 $588,000, for 1939 $784,000, and for 1940 and each year thereafter $980,000. The maximum thus will be a sum appreciably higher than the $720,000 granted annually to the State experiment stations under the original Hatch Act.

No further restrictions are imposed by the act as to the number of regional laboratories, their location, or the scope or details of their work. Decision has therefore been necessary as to the problems for which laboratories should be established, the plan of the research programs in each case, and the working out of relationships with the

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State experiment stations and other agencies in the respective regions in order to coordinate the work with what is already under way. Suggestions have been invited from chiefs of bureaus of the Department and directors of State experiment stations on these and related matters in the attempt to develop an effective and well-coordinated program, and so far as possible policies and plans have been formulated by mutual agreement.

At the time of writing, three regional stations had been definitely provided for. In the order of their announcement these include a vegetable breeding laboratory near Charleston, S. C.; a cooperative soybean industrial research laboratory at Urbana, Ill.; and a grass breeding and pasture laboratory at State College, Pa.

The vegetable breeding laboratory has for its purpose the breeding and introduction of high quality, disease-resistant vegetables especially adapted to the Southern States, the list of those cooperating, through an experiment station council, including Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia. The experimental work is to be centered at the laboratory itself on a tract of about 450 acres acquired near the South Carolina Truck Experiment Station, but the materials produced there will also be tested in the cooperating States, the central laboratory thus serving as a focal point for coordinating this activity in the region. Vegetable varieties from this and other countries will be used in breeding work, and to obtain hardy and disease-resistant vegetables not found in this country (as well as several other kinds of plants) expeditions under the direction of the Division of Plant Exploration and Introduction of the U. S. Department of Agriculture are already en route to India and to Iran (Persia) and Turkey. Construction of an office-laboratory building to cost about $30,000, two greenhouses, and other buildings is under way. The laboratory will be in charge of Dr. B. L. Wade, senior geneticist of the Bureau of Plant Industry, and it is expected that a staff of geneticists, plant physiologists and pathologists, and others will be built up.

The soybean laboratory was organized with special reference to the North Central States area, including Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. The ultimate purpose sought is to obtain through basic research facts and materials applicable to the industrial utilization of the soybean and soybean products and to develop methods whereby these facts and materials may be utilized for the benefit of agriculture. Such information is regarded as especially opportune because of the rapidly increasing importance of this crop in both agriculture and the industries. In 1935 nearly

5,000,000 acres were involved, almost double the acreage in 1925, while the production rose from 5,000,000 bu. to nearly 40,000,000 bu.

The State of Illinois is in the heart of the northern soybean area and has become the largest producer of soybean seed, notably of the yellow oil varieties. The University of Illinois has made available laboratory space and other facilities. Dr. O. E. May of the U. S. D. A. Bureau of Chemistry and Soils has been appointed in charge of the laboratory, while the extensive breeding work contemplated will be under the direction of W. J. Morse of the Bureau of Plant Industry. The research program is to be planned year by year by representatives of these Bureaus and the 12 State experiment stations concerned and the director of the laboratory.

The grass breeding and pasture laboratory was established on recommendation of experiment station directors of the northeastern region, including Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, and West Virginia. Facilities have been made available by the Pennsylvania Experiment Station, which has had under way pasture studies and other relevant work for several years. Among the objectives is the establishment of a nursery of all grasses and legumes adapted to the region. Breeding experiments to develop new and better grasses will be confined at first to Kentucky and Canada bluegrass, timothy, and white and red clover, but work on other species may be undertaken as circumstances permit. The laboratory also expects to determine the seasonal productivity of various legumes and grasses alone and in mixtures, to measure the effect upon growth, chemical composition, feeding value, and production of factors such as soil moisture, soil temperature, soil fertility, length of day, and light intensity, and to study important grasses and legumes as to their resistance to disease and drought, their life history, their growth and development, and their reactions to fertilizers. The leader of the general project is P. V. Cardon, in charge of the Division of Forage Crops and Diseases of the Bureau of Plant Industry.

The establishment of additional regional stations is under consideration, and in due time and with increasing funds provision will doubtless be made to meet the needs of regions not now covered and for extension of work to other fields of research. In the meantime, a new form of organization of much promise has been brought into being and opportunity afforded for a thorough testing of its possibilities and practical usefulness.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Investigations in bacteriological and plant chemistry, Iowa Station] (*Iowa Sta. Rpt. 1935, pp. 65, 66, 90–92*).—This includes brief reports from C. H. Werkman upon fermentation projects both of the xylan prepared from corncobs and of the naturally occurring corncob xylan in situ; and on the utilization of corn sugar in the fermentative production of lactic acid. Other chemical investigations noted are those on the granulation and cloudiness of Iowa honeys, by E. I. Fulmer and O. W. Park; on identification of the water-soluble and the acid-hydrolyzable carbohydrate constituents of the cornstalk, by W. G. Gaessler and R. M. Hixon; and on certain chemical and physical characteristics of corn as these relate to industrial utilization, by Hixon and Gaessler.

Dust, S. C. Blacktin (*Cleveland, Ohio: Sherwood Press, 1934, pp. XI+296, figs. 4*).—The subject is here divided into two sections, of which the first, considering dust "generically", contains an introduction and chapters on dust in general, dust in nature, and dust in everyday experience, while the second section, "dust considered in specific spheres", consists of chapters on dust in experimental sciences, dust in geology, dust in botany, dust in industry and technology, and dust in pathology and physiology—pneumonoconiosis. The book is provided with a glossary, a list of references, an author index, and a subject index.

Chemistry of slash-pine (Pinus caribaea, Morelet).—I, Fatty constituents of the phloem, J. A. Hall and O. Gisvold (*Jour. Biol. Chem., 109 (1935), No. 2, pp. 585–595*).—By treating the phloem of *P. caribaea* with light petroleum (boiling point from 60° to 70° C.), the authors of this contribution from the U. S. D. A. Forest Products Laboratory at Madison, Wis., obtained an extract from which they were able to isolate a sitosterol, $C_{29}H_{50}O$; a sterolin, $C_{35}H_{60}O_6$; a wax alcohol, $C_{26}H_{54}O$; a complex ether, $C_{30}H_{60}O_2$; and *n*-caproic, palmitic, dodecosanic, oleic, and linoleic acids.

The effect of carbon dioxide upon the pH and certain nitrogen fractions of the sugar-beet plant, J. M. Fife and V. L. Frampton (*Jour. Biol. Chem., 109 (1935), No. 2, pp. 643–655, figs. 2*).—In an investigation carried out in the U. S. D. A. Bureau of Plant Industry, it was found that "certain reactions which are catalyzed by the beet plants exposed to high concentrations of carbon dioxide prevent enormous increases in the H-ion concentration of the cell sap. When the juice is expressed from the beet plant immediately after treatment with carbon dioxide, a determination of the increase in pH over that of normal juice indicates to what extent these reactions have taken place. When the beet plants are exposed to a high concentration of carbon dioxide, ammonia is split off from acid amides presumably according to the reaction, $\frac{1}{2}R\cdot CONH_2 + 3H_2O$ yields $R\cdot COONH_4 + R\cdot COOH + NH_4^+ + OH^-$. The increase in ammonia nitrogen found in the juice accounts in full for the observed increase in pH. When high concentrations of carbon dioxide were applied to the plant, ammonia nitrogen was found to have been split off from soluble nitrogenous compounds other than the acid amides.

"Beet plants respond rapidly to carbon dioxide treatment. A significant increase in pH of the extracted juice was obtained after 5 min. exposure to the gas, and a maximum pH was reached in approximately 1 hr. Recovery from carbon dioxide treatment (a return to initial pH) was found to be almost as rapid. The beet plants recovered in about 2 hr. after removal of the plants from the gas chamber.

"The juice expressed from carbon dioxide-treated beet plants is stable with respect to pH. The catalytic agents which accelerate the reaction or reverse the process are active only in the organized plant. This increase in pH as a response to carbon dioxide exposures appears to be a general type of response, for 10 other species of plants were found to respond in a similar manner."

Some analyses of samples of Bence-Jones protein, H. O. CALVERY and R. H. FREYBERG (*Jour. Biol. Chem., 109 (1935), No. 2, pp. 739–743*).—Two samples of Bence-Jones protein were prepared from the urine collected at different periods from one individual and analyses made on each sample for ash, moisture, total nitrogen, amino nitrogen, phosphorus, sulfur, amide nitrogen, humin nitrogen, tyrosine, tryptophan, cystine, arginine, histidine, lysine, aspartic acid, and glutamic acid. These values are compared with those of some other investigators.

Studies of multivalent amino acids and peptides.—I, The synthesis of certain tetravalent amino acids and their derivatives. II, The synthesis of certain derivatives of lysylglutamic acid, J. P. GREENSTEIN (*Jour. Biol. Chem., 109 (1935), No. 2, pp. 529–540; 541–544*).—In the first of the two papers here noted are described the syntheses of the three new tetravalent amino acids, α-aminotricarballylic acid, m. p. 196° C.; α,γ,δ-triamino-$\Delta^{\gamma,\delta}$-pentenic acid, m. p. 171° to 173°; and ϵ,ϵ'-diamino-di-(α-thio-*n*-caproic acid), m. p. 207°. To characterize the latter compound more sharply, its ϵ,ϵ'-diguanido derivative, m. p. 178° to 180° and its ϵ,ϵ'-diphenylureido derivative, m. p. 140°, were prepared. The peptide of α-aminotricarballylic acid, namely, glycyl-α-aminotricarballylic acid, m. p. 195°, was also prepared. The intermediate steps are described.

The second paper describes the preparation from the dipeptide, lysylglutamic acid, of the two derivatives, anhydrolysylglutamic acid amide as the hydrochloride salt, m. p. 242°, and ϵ-guanido-α-aminocapronylglutamic acid, m. p. 95°.

The oxidation of the fatty dibasic acids and of laevulic acid by hydrogen dioxide in presence of a cupric salt, A. P. PONSFORD and I. SMEDLEY-MACLEAN (*Biochem. Jour., 28 (1934), No. 3, pp. 892–897*).—Levulinic acid and the dibasic acids, succinic, glutaric, adipic, suberic, and azelaic, were readily oxidized at 60° C. by hydrogen dioxide in the presence of a cupric salt, a considerable proportion being broken down to carbonic and the lower volatile fatty acids. Succinic acid was produced from glutaric, adipic, suberic, and levulinic acids. Azelaic and suberic acids were less completely broken down than the lower acids. From glutaric acid a small quantity of acetone was formed, indicating a β-keto-oxidation. From both glutaric and levulinic acids, CO_2 was obtained during the steam distillation of the oxidation product. From adipic acid levulinic acid was obtained, indicating β-keto-oxidation. Only in the case of suberic acid was there definite evidence of hydroxy derivatives.

Acid constituents of food products: Special reference to citric, malic, and tartaric acids, B. G. HARTMAN and F. HILLIG (*Jour. Assoc. Off. Agr. Chem., 17 (1934), No. 3, pp. 522–531*).—The authors record the results of analyses carried out for the purposes of the U. S. D. A. Food and Drug Administration and covering a considerable number of fresh and canned fruits and vegetables with respect to their malic acid and citric acid content. The citric acid contents of a group of 28 miscellaneous food products are also shown.

Lactic acid formation in liver, P. A. BOTT and D. W. WILSON (*Jour. Biol. Chem., 109 (1935), No. 2, pp. 455–462*).—A comparison of methods for the preparation of liver extract for lactic acid determinations is reported from the University of Pennsylvania. Errors were shown to occur when the copper-lime procedure was used. Ether extraction was found to be more satisfactory.

Ground liver tissue produced less lactic acid than slices of liver. Freezing with liquid air destroyed the glycolytic activity of liver. Ground muscle and slices produced lactic acid with about equal rapidity.

The concentrations of lactic acid in blood and liver of rabbits, P. A. BOTT and D. W. WILSON (*Jour. Biol. Chem., 109 (1935), No. 2, pp. 463–466*).—Carrying out their determinations as indicated above, the authors find that "the concentration of lactic acid in the blood of well-fed rabbits may rise to very high values following moderate struggling and anesthetizing with amytal. The rise is not so great in fasting animals. The concentration of lactic acid in liver rises and falls with changes in the blood but is usually far below the blood level."

The concentration of vitamin G by adsorption and elution from fullers' earth, S. LEPKOVSKY, W. POPPER, JR., and H. M. EVANS (*Jour. Biol. Chem., 108 (1935), No. 1, pp. 257–265, fig. 4*).—The authors of this contribution from the University of California find the use of pyridine for the elution of vitamin G from fuller's earth to be unnecessary. It is shown that by the methods here detailed "vitamin G can be adsorbed by fuller's earth and eluted with either diluted diethylamine or sodium hydroxide."

Nomogram for centrifugal force, H. SHAPIRO (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 1, p. 25*).—This note presents a set of scales based upon the relation $C=4\pi^2n^2r(=39.478n^2r)$, in which C is the centrifugal force in dynes, n and r being the number of revolutions per second and the radius in centimeters, respectively. In the scale shown, C has been divided by 980, giving the RCF (relative centrifugal force) with respect to the force of gravity. The author notes that "centrifugal forces found by use of this nomogram are too high, in most regions, by from about 2 to 6 percent."

Some observations on the use of automatic extractors, L. E. WARREN (*Jour. Assoc. Off. Agr. Chem., 17 (1934), No. 3, pp. 516–522*).—The author of this contribution from the U. S. D. A. Food and Drug Administration finds that "the advantages of the automatic extractor, as compared with the hand separator, outnumber the disadvantages and even surpass them in their importance. The apparatus is not satisfactory for mixtures of solvents unless the boiling points of the constituents are similar. It may be made in several sizes. If made of Pyrex it is very durable. By the use of the automatic extractor in the more usual analyses from 10 to 20 percent of the analyst's time may be saved. In more difficult separations, particularly those readily producing emulsions, the saving is greater. . . . Also certain organic acids may be separated from their compounds in mixtures and obtained in a free state more easily than they can be by other means."

A stirrer for solvent extraction, J. A. PATTERSON, JR. (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 3, p. 171, fig. 1*).—Drawings show two modifications of a stirrer, by which when rotated, liquid is drawn from one layer and sprayed in fine droplets through the second phase. In this way intimate contact, with a large interfacial surface, is obtained. The stirrer is shown to be particularly advantageous for continuous extractions, in that the body of the liquid which is being sprayed is practically undisturbed and may be drawn off continuously during the extraction.

The two forms in which the stirrer may be made provide for drawing up the heavier of two immiscible liquids and spraying it through the lighter layer and for drawing down the lighter liquid and spraying it through the

heavier layer, respectively. Either form is simply made from glass tubing 5 mm in inside diameter, two sidearms having jet tips 1 cm from the center being provided, while the direction of rotation is such as to cause a reduction of pressure at the jets so that the liquid is drawn through the hollow stem of the stirrer and out through the jets.

Standardization of potassium dichromate, H. H. WILLARD and P. YOUNG (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 1, pp. 57, 58*).—The oxidation value of solid potassium dichromate or of solutions of the reagent may be determined very accurately against the primary standard, arsenious oxide, by treatment of arsenious acid in a sulfuric acid solution with less than its equivalent of dichromate, and titration of the excess reducing agent, in the presence of osmium tetroxide as catalyst and *o*-phenanthroline ferrous complex as indicator, either with ceric sulfate or with potassium permanganate. It was found that the titration could also be made potentiometrically with potassium bromate in a hydrochloric acid solution. Six samples of reagent quality and C. P. potassium dichromate made by different firms showed practically 100 percent purity.

Rapid centrifugal estimation of small amounts of sodium, E. R. CALEY, C. T. BROWN, and H. P. PRICE (*Indus. and Engin. Chem., Analyt. Ed., 6 (1934), No. 3, pp. 202–205*).—Noting that "where a large number of samples must be examined in a short period, as in biochemical investigations, a very rapid method for estimating small amounts of sodium would seem desirable, even though it involved some loss in accuracy," the authors report the observation that measuring the amount of a precipitate by collecting it in a capillary tube under centrifugal force and reading the volume leads to a satisfactory solution of the problem, since triple acetate precipitates are not only voluminous but, under proper conditions, can be obtained in minute uniform particles that pack in capillary tubes in a readily reproducible manner.

"An aqueous reagent was not found practical for these determinations, since comparatively large crystals varying somewhat in size are formed by precipitation in an aqueous system, and these fail to pack in a sufficiently consistent and reproducible manner in capillary tubes. On the other hand, an alcoholic reagent produces minute and uniform crystals, probably because of the more rapid precipitation of the triple acetate in a medium that markedly decreases its solubility. By slightly modifying an alcoholic magnesium uranyl acetate reagent recommended by Kahane [E. S. R., 63, p. 804], a satisfactory precipitant was produced."

The determination of the forms of inorganic phosphorus in soils, R. A. FISHER and R. P. THOMAS (*Jour. Amer. Soc. Agron., 27 (1935), No. 11, pp. 863–873. figs. 2; 28 (1936), No. 2, p. 164*).—An investigation carried out at the Maryland Experiment Station resulted in a method of estimating the different forms of inorganic phosphorus in Maryland soils, based upon the rates of solution of phosphate materials and the subsequent ease of determination by the blue colorimetric method. Briefly, this consists in the extraction of soil with two acid solutions which have selective extracting properties. These solutions were sufficiently buffered to maintain their pH values unchanged during extractions of calcareous as well as acid soils.

As indicated in an erratum note, the pH 2 solution consists of a 0.3 percent solution of potassium acid sulfate. "The H-ion concentration of this solution ranged between pH 1.95 and 1.97. . . . Experiments have shown that this extraction solution, when used in the usual proportion, changed only 0.35 pH with a soil containing 10 percent calcium oxide. The second extractant was a buffered solution of acetic acid containing 3.6 ml of concentrated acetic acid per liter and 19.04 g of sodium acetate. The H-ion concentration of [illegible]

lots of solutions made up in this manner had a range in pH value of 4.98 to 5.02. When used to extract soil containing 20 percent of calcium oxide, the reaction of this extractant changed only 0.30 pH."

Solubility studies upon pure phosphate materials in quantities similar to those found in soils were made to determine the solvent action of these two extractants. A rapid extraction method was then formulated for the estimation of the phosphorus present "in the following three groups of materials: (A) Amorphous and finely divided crystalline phosphates of calcium, magnesium, and manganese; (B) amorphous phosphates of aluminum and iron; and (C) phosphorus absorbed upon hydrous oxides and that present in the form of apatite." The actual quantities of the B and C groups of phosphorus compounds extracted from the soils were arrived at by a continuous leaching method, which, as corrected in the erratum note, showed that the $KHSO_4$ solution extracts $A+\frac{6B}{11}+\frac{C}{2}$.

"Twenty-two representative Maryland soils were analyzed by this method and concurrently tested in pot experiments for response to phosphate fertilizations. This method of analysis placed the soils in practically the same order of phosphorus needs as did the pot tests."

A new method for testing the purity of marls and limestones, G. J. Bouyoucos (*Soil. Sci., 41 (1936), No. 2, pp. 131–133*).—A new method for determining the purity of marls and limestones has been developed at the Michigan Experiment Station. The principle of this method is that of determining the specific gravity, by means of the hydrometer, of the calcium chloride solutions formed when marls and limestones are treated with hydrochloric acid. A knowledge of the specific gravity of the acid and of the calcium chloride solution formed when pure calcite crystals are treated with the acid permits ready calculation of the purity of the marls and limestones.

The method was compared with the gasometric method, and both gave approximately the same results.

A chemical method for determining the safeness to foliage of commercial calcium arsenates, G. W. Pearce, L. B. Norton, and P. J. Chapman (*New York State Sta. Tech. Bul. 234 (1935), pp. 15, fig. 1*).—It is pointed out that commercial calcium arsenates vary in safeness to foliage when tested under the same conditions, the tendency to "burn" being a characteristic of the preparation. "The results of gross analyses of commercial preparations cannot be correlated with their safeness. Water-soluble arsenic, as determined by the Official method, is not a true index to injury. A tentative method has been developed for determining the safeness to foliage of calcium arsenates as follows:

"A 0.5-g sample is weighed into a 500-cc Erlenmeyer flask and 100 cc of water added. The suspension is allowed to stand with frequent shaking for 2 or 3 hr. Three drops of a 1 percent alcoholic solution of thymolphthalein are added, and the mixture is titrated with a freshly prepared solution of carbon dioxide, approximately 0.02 N, until the blue color disappears permanently. In most cases, some blue color reappears on standing for a few minutes and several drops more of the carbon dioxide solution must be added. Samples have occasionally been found which require additions of the reagent over a period of several hours before a permanent end point is reached. After the titration, enough water is added to bring the total volume up to 250 cc, and the sample is allowed to stand for 24 hr., with occasional shaking. The suspension is then filtered through a dry filter, and the arsenic determined in a convenient aliquot of the filtrate."

"Water-soluble arsenic in representative commercial preparations has been found to vary from 0.20 to 11.50 percent As_2O_5 by this procedure. A 'safe' brand should contain less than 0.75 percent water-soluble As_2O_5. A correlation between water-soluble lime, 'reserve alkalinity', and degree of injury has also been observed if such determinations are made after carbonation of the free lime. The water-soluble arsenic responsible for injury is apparently derived primarily from the more soluble compounds of calcium and arsenic likely to be present rather than by decomposition of the material as a whole by carbon dioxide."

Some observations on the use of selenium and its compounds as a catalyst in the determination of protein in wheat by the Kjeldahl method, S. R. SNIDER and D. A. COLEMAN (*Cereal Chem., 11 (1934), No. 4, pp. 414–430, figs. 4.*)—An investigation carried out at the U. S. D. A. Bureau of Plant Industry yielded numerous data with respect to the effects of various proportions of potassium sulfate upon the boiling points of the digests, and showed the effects upon both digestion and nitrogen recovery of several single and combined catalysts, including mercury, selenium, and copper compounds. The following is only a partial quotation of the results stated:

"The rapid clearing of selenium digests must be explained in large part by catalytic effects, as this clearing appears at much lower boiling temperatures than is characteristic of the HgO–K_2SO_4 digests which have a much higher boiling point. What has been said of selenium must also be true in part for red HgO, as the 2° C. rise in temperature caused by the addition of 0.5 g of red HgO is not sufficient to explain the more rapid digestion phenomena when this reagent is added. The substitution of metallic selenium, in amounts varying from 75 to 250 mg for the 0.5 g of red HgO in the Kjeldahl digestion mixture results in low values when analyzing wheat for crude protein content. The use of a combination of 0.3 g SeO_2 and 0.05 g of copper in place of the 0.5 g red HgO in the formula reduces somewhat the time (15 to 20 percent) necessary for determinations. The difference is not significant when the extra cost of the selenious acid is taken into consideration. The use of selenium oxychloride as a catalyst in the amounts used—0.2 cc—has no advantage over 0.5 g of red HgO. The use of a combination of 0.1 g of nickel and 0.1 g of selenium as catalysts, while inducing the most rapid digest clearing time, gave protein determinations that were too low.

"There is apparently no positive relationship between rapidity of clearing of the digests and the accuracy of the protein determinations. Indeed the slowest clearing digest (the standard procedure with a 12-min. clearing) accompanied the most accurate results. Mossy zinc cannot be used as an ebullient with selenium in any of its forms as it causes excessive frothing. Granular zinc (30 mesh), however, can be used. Noxious fumes, presumably hydrogen selenide, are always present when zinc in any form is used as an ebullient if by any chance the caustic used for neutralization of the diluted digest is not sufficiently concentrated to insure strong alkalinity. These fumes present a serious health hazard, especially when large numbers of tests are being carried on."

The determination of thiol and disulfide compounds, with special reference to cysteine and cystine, I, II, K. SHINOHARA (*Jour. Biol. Chem., 109 (1935), No. 2, pp. 665–679, figs. 4; 110 (1935), No. 2, pp. 263–277, figs. 2*).—A detailed investigation is reported.

I. *Critical study of the color reaction between phospho-18-tungstic acid reagent and thiol compounds.*—It is concluded that thiol compounds reacting with the phosphotungstic acids here dealt with are oxidized only to the disulfide stage. The author arrived at a technic described, in part, as follows: "10 cc

of 2 M sodium acetate, 3 cc of 2 M acetic acid solution, and an indefinite amount of water are first put into a 50-cc glass stoppered volumetric flask. Usually following the addition of a definite amount of the cysteine solution or a solution of other substances, 4 cc of the reagent are added to the buffer solution and the total volume of the reaction mixture is made exactly 50 cc. When more than 3 cc of the cysteine solution in 0.2 M HCl or a large amount of any other acid solution is added, the acid is neutralized by adding an equivalent amount of NaOH solution. Thus the pH of the solution is maintained in the close neighborhood of 5.0, and its composition is 0.4 M in sodium acetate, 0.12 M in acetic acid, 80 cc per liter in the reagent, and varying concentrations in other compounds. Immediately after it is made up to 50 cc, the flask is stoppered and shaken vigorously. The color intensity, which usually reaches the maximum within a few minutes, is measured after 5 to 10 min. unless a kinetic measurement is made."

II. *A critical study of the reaction between phospho-18-tungstic acid reagent and other substances than thiol compounds.*—A study is reported of possible interfering substances, both compounds which prevent the development of the color and reductants, organic and inorganic, likely to add to the color produced by cysteine itself.

The reaction between cysteine and formaldehyde, which was found to complete itself within 1 min. under the experimental conditions specified, furnished a method better than that of the use of mercuric chloride for inhibiting the cysteine reaction so that colorimetric values for extraneous reducing substances could be measured.

"If hydrogen sulfide is detected in the solution . . . it should be driven off by bubbling nitrogen or carbon dioxide gas through the solution, preferably under reduced pressure. If an odor of mercaptan is detected, the solution, after first being acidified, is shaken two or three times with an equal volume of chloroform each time. This should be done whenever chloroform-soluble organic substances are present. The aqueous portion is filtered through a wet filter if necessary." Chloroform is preferred to ether for this extraction because "unlike ether, it remains inert [with respect to color production] even in the presence of sulfite."

To determine cystine, cysteine is first to be determined, the cystine is to be reduced by tin dust (neither granulated tin nor zinc in any form was satisfactory), the tin compounds to be got rid of as sulfide and the hydrogen sulfide driven out by means either of nitrogen or of carbon dioxide, and the total cysteine then present to be determined after readjustment to a suitable pH value, as before.

The application to the colorimeter of the Schoenheimer and Sperry method for the determination of total and free cholesterol, F. Fitz (*Jour. Biol. Chem., 109 (1935), No. 2, pp. 523–527*).—The author reports upon an adaptation for the colorimeter of the Schoenheimer and Sperry method (E. S. R., 73, p. 298) for cholesterol determination.

"In the preparation of the serum extract 0.5 cc of blood serum is made up to 10 cc with the acetone-absolute alcohol solution, whereas the original procedure advocates the use of 0.2 cc made up to 5 cc. By so doing, 1-cc portions of the filtrate generally contain more than 0.05 mg of total cholesterol. For the free cholesterol fraction, 3 cc of the extract and 1.55 cc of the digitonin solution are used in place of 2 cc of the extract and 1 cc of digitonin solution as called for in the original method. The precipitation of the cholesterol, the washing of the digitonide, and the development of the color are carried out as presented in the Schoenheimer and Sperry communication In place of

using a new standard for each or for every few samples, a standard containing 5 times the volume of a single standard is employed and fresh portions are transferred to the standard cell for each determination. With these minor modifications for use with the colorimeter, duplicate and triplicate determinations have been obtained with maximum deviations from the mean of less than 3 percent."

A new method for the separation of sterols from vitamin D-containing materials, S. NATELSON and A. E. SOBEL (*Jour. Biol. Chem., 109 (1935), No. 2, pp. 687–694*).—The authors find that sterols may be separated efficiently from vitamin D-containing material, such as cod-liver oil, irradiated cholesterol, and irradiated ergosterol, by converting them to potassium salts of their sulfuric acid esters, and that the sterols are readily transformed to these salts by means of pyridine chlorosulfonate in the presence of excess pyridine, followed by treatment with potassium hydroxide. The salt formed is insoluble in organic solvents.

"Dry potassium ergosterol sulfate cannot be activated antirachitically. It may be activated after boiling in aqueous medium.

"Insoluble potassium sulfate derivatives may be isolated from phenol, ergosterol, cholesterol, and borneol when treated with pyridine chlorosulfonate in chloroform solution, but not from the antirachitic vitamin in cod-liver oil, calciferol, irradiated ergosterol, and irradiated cholesterol."

Importance of enzyme analysis in agricultural chemistry, A. K. BALLS (*Jour. Assoc. Off. Agr. Chem., 17 (1934), No. 3, pp. 531–534*).—The relation of enzymes to baking quality, brewing quality, jelly-forming capacity, the ripening of fruits and their spoilage, and to a number of other important properties of agricultural products is briefly indicated in a discussion contributed from the U. S. D. A. Bureau of Chemistry and Soils, and the value of enzyme activity determinations in many of these cases is pointed out.

The chemical determination of the quality of canned green peas, Z. I. KERTESZ (*New York State Sta. Tech. Bul. 233 (1935), pp. 26, figs. 4*).—In this bulletin evidence indicating that in canned peas the scores for maturity and tenderness on one hand and flavor on the other are strictly proportional is presented. Thus "conclusions regarding the flavor might be drawn from the maturity score."

A study of the possible use of total solids, alcohol-insoluble solids, and water-insoluble solids content of canned peas for the determination of maturity was made. "Of these three constituents, the alcohol-insoluble solids content of the peas appears to be best suited for the evaluation of the maturity and quality of canned peas."

Two possible grading systems are proposed in which the determination of the alcohol-insoluble solids replaces organoleptic evaluation of maturity plus tenderness (chemical method I) and the flavor in addition (chemical method II). The correlations between results obtained by the chemical methods and by the standard method are shown and discussed.

Grape juices pasteurized at lower temperature, C. S. PEDERSON (*Farm Res. [New York State Sta.], 2 (1936), No. 2, p. 9*).—The author notes the possibility of reducing pasteurizing temperatures for grape juice from 190° to 165° F. if care is taken to eliminate air from the bottles and to remove foam, suspended solids, and other materials which can prevent the heat from reaching the spores so protected. The observation that molds may grow into the pores of corks in such a manner as to make sterilization of the corks practically impossible is also noted.

AGRICULTURAL METEOROLOGY

A simple test of value of a particular period in forecasting, S. R. SAYER (*Indian Acad. Sci. Proc., 2 (1935), No. 4, Sect. A, pp. 336–341; abs. in Sci. Abs., Sect. A—Phys., 39 (1936), No. 457, p. 33*).—"A simple method of testing whether a particular period is of use in forecasting is explained. The method was first tested on artificial sets of data in two of which random variations were superposed upon a periodic variation, and in the remaining three there were no periodicities at all. In the former case the periodicity tested was found to be significant, while in the latter the periodicity was not significant. When the same method was applied to see whether the 23-yr. period, suggested by C. G. Abbot [E. S. R., 70, p. 301], would be of use in forecasting annual rainfall at Madras and Nagpur, it was found that the period is not of use."

Microclimatic field temperatures as influenced by clouds and wind [trans. title], H. G. KOCH (*Bioklim. Beibl. Met. Ztschr., 2 (1935), No. 3, pp. 121–124, figs. 2; abs. in Ann. Agron. [Paris], n. ser., 6 (1936), No. 1, pp. 160, 161*).—The influence of nocturnal clouds in reducing radiation and raising temperature in a growth of coniferous trees is discussed. The increase was found to be as much as 1° C. in young plantations, but somewhat less among taller trees.

Some selected [weather-crop] references, compiled by J. H. PARKER (*Kansas Sta., 1935, pp. 18*).—A mimeographed list of 205 selected references to literature dealing with the relation of weather to crops.

Relation of climatic factors to yield of crops [trans. title], J. ŠIMEK (*Sborn. Československ. Akad. Zeměděl. (Ann. Czechoslovak Acad. Agr.), 10 (1935), No. 3, pp. 281–287; Ger. abs., p. 287; abs. in Ann. Agron. [Paris], n. ser., 6 (1936), No. 1, p. 161*).—As a result of 10 years' observations in Morava-Slezsko, it was found that the larger yields of winter wheat were obtained with a dry autumn and winter, a sunny January, a cloudy February, a warm and wet March, a cloudy April, a breezy May, and a sunny June; of winter barley, with a cloudy autumn and winter, rains in February and March, and a sunny May; of oats, a rainy winter, a sunny March and April, and a warm May and July; of potatoes, a warm and sunny March, a breezy April, a wet May, and a warm summer; of forage sugar beets, a moist and warm April, a sunny May, and adequate rainfall in June and especially in July.

Influence of spring rains on Italian agriculture [trans. title], S. JOVINO (*Italia Agr., 72 (1935), No. 10, pp. 797–804, fig. 1; abs. in Ann. Agron. [Paris], n. ser., 6 (1936), No. 1, p. 160*).—The author compares meteorological conditions and wheat yields over a period of 10 yr. The yields were highest in those years having dry springs. Rain during the period immediately preceding heading did not seem to be indispensable for high yields. In 1935, the year of maximum yield, the spring was dry and there were no rains immediately before or after heading.

Relation of rainfall to flood run-off, C. R. PETTIS (*Mil. Engin., 28 (1936), No. 158, pp. 94–98, figs. 2*).—In this paper the relation of rainfall to flood run-off is reduced to a simple mathematical basis.

The damage to crops in the Nasik District by the frost of January 1934, R. S. DUBHASHI (*Agr. and Livestock in India, 5 (1935), No. 6, pp. 676–682, pls. 2, fig. 1*).—The effects of severe cold spells in January 1934 in the Nasik District of India on bananas, sugarcane, citrus fruits, alfalfa, and various other crops are described. The effect on sugarcane, one of the principal money crops of the district, was to dry up the shoots, kill the growing points, cause rot to set in, and lower the percentage of sugar in the cane. In case of damaged shoots the growing energy of the plant was diverted to the nodes lower down, forcing the eye buds to sprout. Sucrose was inverted into glucose in the

canes, with impairment of the color and the crystallizing power of the juice. Bananas, tomatoes, chillies, and gourds were among the first of the crops to suffer. Among the irrigated crops that stood the frost without damage were the onion, garlic, alfalfa, and citrus fruit trees. There was no damage with temperatures above 40° F. The advantages of heating, irrigation, and windbreaks for protection against frosts are discussed.

[Frost damage to horticultural crops], W. A. BANE (*Jour. Min. Agr.* [*Gt. Brit.*], *42* (*1936*), *No. 12, pp. 1212–1218, pl. 1*).—Results of a survey of fruit farms injured by frosts in May 1935 put particular emphasis "on the value of height [of orchard sites] relative to that of the surrounding land; the good effect of nearness to large rivers or the sea; the lack of evidence with regard to manuring and cultivation; the good and bad effects of windbreaks; and the variation in susceptibility to damage among varieties. . . . Katabatic winds, i. e., winds caused by the flow of cold air down a slope, are of considerable importance in connection with the prevention of frost damage, as they may not only influence the severity of frost within any given orchard but also modify the results of heating the orchard." Accurate knowledge of such winds might make it possible to increase the efficiency of heating methods or lead to their abandonment.

Frost risks and frost forecasting (*Melbourne: Bur. Met., 1934, pp. 11, fig. 1*).—Frost risks, forecasting, critical temperatures for different crops, and protective measures as applied to Australian conditions are discussed. The choice of site as a preventive measure is emphasized. Of critical temperatures the author says:

"The condition of the tree, the stage of advance of the buds or blossoms, their position on the tree or limb, the moisture in the atmosphere, the length of duration of the low temperature, and the previous weather that the tree has been subjected to, all enter into the problem of frost damage. It has been pointed out that there is a range of at least 5° F. between the temperature at which all of the buds will be killed and that at which only 5 percent will be lost. If there are few blossoms on the tree, the critical temperature, therefore, will be higher than when it blossoms so freely that a large percentage can be spared and yet leave as many as should develop fruit. Usually if only 2 percent of the live buds of peaches remain to mature, it will mean a fair crop of fruit. It is frequently said that a fruit tree in an average year should lose about 90 percent of its buds or blossoms."

Orchard heating, A. H. HOARE (*Jour. Min. Agr.* [*Gt. Brit.*], *42* (*1936*), *No. 12, pp. 1218–1220, pl. 1*).—Attention is called to tests of a liquid fuel burner, devised by a practical orchardist, which appears to be capable, when used at the rate of 50 heaters per acre properly distributed, of maintaining the air temperatures of orchards above the danger point. "This heater consists of a metal canister having a flame hole, covered by a lid, in the top, and 6 airholes in the side separated by a quarter of the circumference. The wicks are made of asbestos rope so that they can be used throughout the season without renewal by simply resoaking them in fuel oil when the latter is renewed. The heaters are designed to burn crude oil. . . . The heaters are now designed to burn for a period of 11–12 hr. The fuel capacity is 3 gal. . . . The conclusions to be drawn after the tests of the system provided by the severe frosts of May 1935 are that orchard heating is practicable provided the organization is good, the number of heaters to the acre is not below the minimum laid down, and that there is little or no wind."

New devices for the forest fire protectionist, D. N. MATTHEWS (*Northwest. Sci., 9* (*1935*), *No. 4, pp. 18–20*).—New devices referred to in this article which have proved useful in protection against forest fires include a home meter for

rating visibility, a fan psychrometer which is easier to read than ordinary forms, relative humidity charts which involve no computations, and scales for weighing moisture content in inflammable forest materials.

Monthly Weather Review, [November–December 1935] (*U. S. Mo. Weather Rev., 63 (1935), Nos. 11, pp. 313–338, pls. 16, figs. 3; 12, pp. 339–374, pls. 15, figs. 2*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions.

No. 11.—Our Veteran Cooperative Observers, by J. B. Kincer (pp. 313–315); Snow Garlands on Tree Limbs, by W. J. Humphreys (p. 315); The Atlantic-Gulf of Mexico Hurricane of October 30 to November 8, 1935, by W. E. Hurd (pp. 316–318); and On the Meteorological History of the Hurricane of November 1935, by H. R. Byers (pp. 318–322).

No. 12.—Progress in International Meteorology, by W. R. Gregg (pp. 339–342); The Danzig Meetings of the International Climatological Commission and the Commission on Agricultural Meteorology, by J. B. Kincer (pp. 342–344); Mexican West Coast Cyclones, by D. Blake (pp. 344–348); Unusual Tunderstorm Activity in the Mountains of Oregon and Washington in 1935, by W. G. Morris (pp. 348, 349); Preliminary Report on Tornadoes in the United States during 1935 (p. 349) and The Weather of 1935 in the United States (pp. 349–351), both by R. J. Martin; and Tropical Storms in the North Atlantic Ocean during 1935, by W. E. Hurd (p. 351).

Meteorological observations, [1935], C. I. GUNNESS ET AL. (*Massachusetts Sta. Met. Ser. Buls. 553–564 (1935), pp. 4 each*).—These are the usual summaries of observations for each month at Amherst, Mass., with brief notes on the more significant features.

The December number contains an annual summary for 1935, which shows that the mean pressure for the year was 30.02 in.; the mean temperature 47.1° F., as compared with the normal of 47.2°, highest 95° July 6, lowest —21° January 28; total precipitation 34.08 in., as compared with the normal of 43.49 in., snowfall 47.75 in., as compared with the normal of 48.38 in.; mean cloudiness 55.8 percent, bright sunshine 50.3 percent; last frost in spring May 25, first in fall September 17; last snow April 17, first November 17.

Meteorological report for 1934, F. E. HEPNER (*Wyoming Sta. Rpt. 1935, pp. 41–43*).—The usual summaries of observations on pressure, temperature, precipitation, wind, and sunshine at the University of Wyoming at Laramie are given, with comments on some of the more significant features of the weather of 1934.

SOILS—FERTILIZERS

[Soil investigations by the Iowa Station] (*Iowa Sta. Rpt. 1935, pp. 135–148, 153, 154, fig. 1*).—The soil studies noted in this report include effects of fertilizers under various rotations and of various amounts of fertilizers applied at different times in the rotation on crops and soil conditions in the Wisconsin drift area, and the relative value of red clover, alfalfa, and sweetclover as soil-building crops, all by P. E. Brown, J. L. Boatman, and L. W. Forman; effects of fertilizing materials and methods of grazing on soil conditions and plant growth on permanent pastures, by Brown, H. R. Meldrum, A. J. Englehorn, Boatman, and Forman; effects of various fertilizing materials on crop growth on Carrington and Webster soils by Meldrum, Englehorn, and R. E. Bennett, on Grundy soils and some terrace and bottom land soils by Meldrum and Englehorn, on Clarion loam by Meldrum and Bennett, on Tama silt loam

by Brown, Meldrum, Englehorn, Bennett, and R. H. Walker, on Muscatine silt loam and Clinton silt loam by Englehorn and Bennett, and on Marshall silt loam by Meldrum; value of commercial cultures for the inoculation of legumes and nonlegumes, the occurrence and activities of *Azotobacter* in Iowa soils as influenced by soil treatment, physiological studies on *Rhizobium*, the buffer capacity and related chemical characteristics of the principal soil types of Iowa, and the occurrence and activities of legume bacteria in acid soils as influenced by soil treatment, all by Walker; nitrate assimilation in soils, occurrence and activities of fungi in Iowa soils, the available phosphorus in Iowa soils, and the formation of humus and the decomposition of organic matter in soils, all by F. B. Smith; the plant food content and lime requirements of Iowa soils and the composition of various crops, by Brown, Englehorn, and Bennett, and lime by Brown; and character and management of the alkali soils of Iowa, by Brown, Smith, and Boatman.

[Soil investigations of the Missouri Station] (*Missouri Sta. Bul. 358 (1935), pp. 96–103, 111, 112*).—The station's soil work for 1934 is summarized in the following notes:

Land classification of Missouri, by H. H. Krusekopf and H. Jenny; correlation between exchangeable bases and pasture vegetation, by Jenny; crop rotation and fertilizer trials on soil experiment fields, soil erosion, and increasing the productivity of Missouri pastures, all by M. F. Miller and Krusekopf; the accumulation or depletion of nitrogen and carbon in soils under different systems of soil treatment and management, by Miller, W. A. Albrecht, and Jenny; effects of different soil treatments long continued upon bacterial activity in the soil, use of fine limestone, the calcium content of soils and its relation to acidity and the response of soils to liming, production and distribution of bacteria for legumes, and testing of soils for their lime need, all by Albrecht; relation between soil colloids and climate, by Jenny and C. D. Leonard; the tendency of Missouri clay colloids to develop clay pans, by Jenny and G. D. Smith; ionic exchange involving polyvalent cations, by Jenny and J. E. Gieseking; a classification of soil structure, and factors affecting soil granulation, both by L. D. Baver; liquid intake by soil colloids, by H. F. Winterkorn and Baver; the swelling of soil colloids and the hydration of Putnam clay, both by Baver, Winterkorn, and J. F. Lutz; and the nature of the colloidal material responsible for the physicochemical properties of Putnam clay and bentonite, by Baver and G. Horner.

[New Mexico soil work] (*New Mexico Sta. Rpt. 1935, pp. 34, 35*).—Reports are made upon effects of irrigation and cropping on soil profiles, and upon an observation of the penetration of soils containing 1.2 percent of "alkali" salts by alfalfa roots. The soluble salts were in this instance made up of about one-third of calcium sulfate and about two-thirds of sodium sulfate.

[Soil investigations by the Washington Station] (*Washington Sta. Bul. 325 (1935), pp. 19–22, 64*).—The report contains brief notes on fertility investigations of Washington soils (including the more efficient utilization of barnyard manure), by L. C. Wheeting and S. C. Vandecaveye; the maintenance of organic matter in eastern Washington soils, by Vandecaveye and Wheeting; plant composition as influenced by variation in climate and soil type, by Vandecaveye, Wheeting, and G. O. Baker; maintenance of organic matter in central Washington, by Wheeting, Vandecaveye, and C. I. Seely; and quality of irrigation and drainage water and specific conductance of soils, both by C. A. Larson, from the Irrigation Substation.

[Soil analysis and fertility work, South Carolina Station] (*South Carolina Sta. Rpt. 1935, pp. 56, 125–129, 130, 131, figs. 2*).—Notes are given on factors influencing the iodine content of plants, by J. H. Mitchell and W. J.

Hanna; a study of the relationship between the mineral content of the soil and the plants grown on the soil, by Mitchell, D. B. Roderick, and W. B. Keller; growth response of crops to applications of lime material and potash fertilizers, by H. P. Cooper and R. W. Wallace; and soil fertility studies, including lysimeter investigations, by N. McKaig, Jr. (U. S. D. A. Bureau of Plant Industry).

[Texas Station soil work of 1934] (*Texas Sta. Rpt. 1934, pp. 15, 16, 200–202*).—Data are given on nitrification, by G. S. Fraps and A. J. Sterges, and on soil improvement investigations at Nacogdoches.

[Soil Survey Reports, 1930 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1930, Nos. 37, pp. 60, figs. 2, map 1; 39, pp. 43, figs. 3, map 1*).—The first of the two surveys here noted was made with the cooperation of the Indiana Experiment Station and the second with that of the Michigan Station and the Michigan Department of Conservation.

No. 37. *Soil survey of Ohio and Switzerland Counties, Indiana*, B. H. Hendrickson et al.—These counties, in southeastern Indiana, contain a total of 196,480 acres of a plateau region now much dissected by numerous small streams which give the two counties very good drainage. With the inclusion of several phases in each, the principal soils mapped and described are Fairmount silty clay loam 38.4 percent, Switzerland silt loam 23.9 percent, and Cincinnati silt loam 12.1 percent of the area upon which report is made. The soils of the two counties comprised 18 series inclusive of 25 types. A section on the management of these soils, by A. T. Wiancko and S. D. Connor, is included.

No. 39. *Soil survey of Montmorency County, Michigan*, J. O. Veatch et al.—Montmorency County, in the northern end of the Lower Peninsula of Michigan, occupies an area of 353,920 acres in the glaciated plain of the Great Lakes region, the lands being for the most part level to gently rolling.

The report maps and describes 23 series of 26 types. The more extensive types named are Grayling sand 17.3 percent, Roselawn sand and Emmet sandy loam each 11.9, Roselawn sandy loam 11.2, Rifle peat 10.5, and Rubicon sand 10.1 percent of the county area.

"From an inventory of the land resources, the conclusion has been reached that 75 or more percent of the total area of the county offers little possibility for economic utilization for cultivated crops and only partial use for extensive grazing."

[Soil Survey Reports, 1931 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1931, Nos. 12, pp. 29, figs. 3, map 1; 13, pp. 45, pl. 1, figs. 3, map 1; 14, pp. 39, figs. 2, map 1; 15, pp. 38, pls. 2, figs. 2, map 1*).—The four surveys recorded in these reports were carried out with the cooperation of the respective State experiment stations.

12. *Soil survey of Bourbon County, Kansas*, M. H. Layton and C. E. Dornberger.—Bourbon County, southeastern Kansas, comprises 404,480 acres of smooth plain lands drained by the Marmaton and Little Osage Rivers and their tributaries.

The soils of Bourbon County were found to consist of 12 types belonging to 9 series. The more extensive types found are Summit silty clay loam, amounting to 38.1 percent of the total area of the county; Labette silt loam 21.2 percent; and Parsons silt loam 22.9 percent. "About 60 percent of the land is tillable."

No. 13. *Soil survey of Scurry County, Texas*, E. H. Templin and T. C. Reitch.—Scurry County, west-central Texas, consists of 582,400 acres of plain lands of which about 16 percent are flat, 19 percent rough, and the remainder more or less rolling. The lower of the two plains in the county has good

drainage except in depressions, but in the flat lands no regional drainage lines have developed.

The soils are mapped as 10 series inclusive of 24 types. Abilene clay loam forms 23.8 percent of the county, and Miles fine sandy loam 12.7. Rough broken and stony land constitutes 13.4 percent, and "soils unsuitable for farming" totaled 25.7 percent of nonarable land.

No. 14. *Soil survey of Kiowa County, Oklahoma*, A. W. Goke and C. A. Hollopeter.—Kiowa County consists of 650,000 acres of smooth plain lands located in southwestern Oklahoma and dependent upon the North Fork Red River, the Washita River, and their tributaries for its drainage.

The report lists 23 soil types, representative of 13 series, and including, as the more extensive soils, Ford silt loam, which was found to cover 19.6 percent of the county; Tillman clay loam, amounting to 19.1 percent; and Vernon clay loam, 13.0 percent. Rough stony land, river wash, and dune sand, totaling 7.7 percent, are the areas listed unclassified, and with other lands grouped together as "noncultivated lands" occupy 12.5 percent of the county.

No. 15. *Soil survey of Le Flore County, Oklahoma*, E. W. Knobel and C. B. and W. C. Boatright.—Le Flore County, in southeastern Oklahoma, has an area of 1,021,440 acres including, in its northern part, "a smooth plain with isolated table mountain masses standing on it," and in the southern part a mountainous section, the whole area being drained mostly by the Poteau River.

Hanceville rough stony land constitutes 32.2 percent of the county, Hanceville stony loam a further 18.9 percent, and Conway very fine sandy loam 15.5 percent. The report lists 13 series in which are included 19 types. Recommendations for management by H. J. Harper are included.

[Soil Survey Reports, 1932 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1932, Nos. 3, pp. 42, figs. 2, map 1; 4, pp. 38, figs. 2, map 1; 5, pp. 42, figs. 2, map 1*).—The surveys recorded in the three reports here noted were made with the cooperation of the [New York] Cornell Experiment Station, the University of Nebraska, and the Mississippi Geological Survey, respectively.

No. 3. *Soil survey of Chemung County, New York*, C. S. Pearson et al.—Chemung County lies in the south-central part of the State, occupying 260,480 acres of the southwestern plateau section of the State, the original plateau having been here much dissected. Practically the entire county lies in the Susquehanna drainage basin, with a narrow strip in the Ontario basin.

Volusia gravelly silt loam areas amounting to 24.1 percent of the total area of the county were mapped, together with 29.9 percent of Lordstown stony silt loam, and Mardin gravelly silt loam 10.8 percent. In all, 24 series inclusive of 30 types were found. The land is also classified according to natural productivity.

No. 4. *Soil survey of Valley County, Nebraska*, R. L. Gemmell et al.—Valley County, in central Nebraska, occupies an area of 362,240 acres, of which about 85 percent is upland and the remainder terrace and bottom land. Practically all of the county is well drained.

The soils mapped and described consist of 15 series in which are included 20 types. The soils of important extent are Colby silt loam, which covers 34.6 percent of the area; Hastings silt loam 24.4 percent; and Hall silt loam, of which 18.3 percent was found.

No. 5. *Soil survey of Greene County, Mississippi*, J. W. Moon and S. R. Bacon.—Greene County, in southeastern Mississippi, consists of 454,400 acres of a much dissected plain. "About 75 percent of the soils are well drained or

excessively drained, and natural drainage of the rest is inadequate for cultivation, some areas being continually saturated or subject to periodic overflow." About "5 percent of the county consists of productive agricultural soils adapted to the cultivated crops generally grown in the area, an additional 15 percent may be considered fair," and the remaining 80 percent is not adapted to cultivation.

Muck, rough broken land, and swamp constitute 22.9 percent of the county. The classified soils are listed as 17 series of 24 types. Cuthbert fine sandy loam, which covers 17.4 percent of the county, has a "tight subsoil and upper substratum" and "is restricted largely to forestry."

Testing soils as a service measure, R. C. COLLISON (*Farm Res. [New York State Sta.], 2 (1936), No. 2, pp. 1, 12*).—The author points out certain limitations of the usefulness of analyses of soil samples sent to the station and the desirability of supplementary data. "The best basis for recommendations is the actual performance of various crops on the soil in question."

The chemical and physical properties of dry-land soils and of their colloids, I. C. BROWN and H. G. BYERS (*U. S. Dept. Agr., Tech. Bul. 502 (1935), pp. 56*).—The authors report upon an investigation of the mechanical and chemical composition of 13 soil profiles derived from soils developed under a rainfall ranging between 8.5 and 23 in. with a mean annual temperature range between 40° and 69° F. A field description of each soil series and of the particular profile examined is given. These descriptions include information concerning parent material, vegetation, and climate. The parent material of these soils includes granites, shales, and aeolian and alluvial materials.

The colloids from these profiles were extracted and analyzed, the carbon-nitrogen ratios of both soil and colloid having been determined. It is shown that the dry-land soils and colloids investigated have a carbon-nitrogen ratio which in the surface material is fairly uniform and lies below the ratio of 10:1. It was found that as a rule this ratio decreases with depth. The inorganic soil acid of these 13 profiles had an average composition expressed by the mean silica-sesquioxide ratio 3.31, silica-alumina ratio 4.07, water-sesquioxide ratio 2.27, and water-alumina ratio 2.78. The mean water-vapor absorption of the colloids at 99-percent humidity compared with that at 75-percent humidity had a mean value of 2.14. This was found to be the most uniform characteristic of the dry-land colloids.

"It is inferred from the data that the dry-land soils under their environmental conditions tend to produce a colloid of the pyrophyllic acid type, or one dominated by an approach toward the ideal composition of the inorganic complex $3H_2O.Al_2O_3.4SiO_2$. Various influences modify the composition, but in these soils the most effective cause of variation is assumed to be the parent material."

Soil swelling.—I, The swelling of soil in water considered in connection with the problem of soil structure, D. T. SIDERI (*Soil Sci., 41 (1936), No. 2, pp. 135–151, fig. 1*).—The author considers that a study of the swelling of soil in natural structural condition "allows investigation of the problem of soil structure from a new point of view." He presents a method, derives a form for a quantitative expression of the porosity changes caused by absorption of water by soil, and introduces definitions of the "index of texture stability" (S) and of "swelling water" (Wq), founded on the sharp difference between capillary imbibition and swelling proper.

"Swelling water may be considered as the form of expressing the hydrophilic property of soil. Soil swelling is considered as a process of changes arising in the properties of soil at the interface $\frac{\text{soil colloids}}{\text{water}}$. This process leads to

a change in the structure of soil and to an increase in its degree of dispersion. A quantitative expression of this process is possible in the form of swelling water, which represents a more characteristic indicator of swelling than the increase of volume."

A method for a differential analysis of soil porosity, providing for its subdivision into noncapillary, capillary, and submicroscopic porosity, is proposed.

Sorption in an ideal soil, W. O. SMITH (*Soil Sci., 41 (1936), No. 3, pp. 209–230, figs. 8*).—As the basis for a mathematical discussion, the author of this contribution from the Pennsylvania State College defines an ideal soil as "an assemblage of spheres packed at random; it possesses a structure which, if the spheres are not too large, renders it an absorbent. It may accommodate masses of liquid condensed from the vapor state into capillary bodies; i. e., capillary condensation. It may, depending on the grain size, also offer an internal surface sufficiently large to hold an appreciable amount of liquid and render it an absorbent as well; the molecules of the sorbed vapor are held in the form of an adsorbed layer, generally monomolecular, which extends over the available surface of the grains. Thus if into a quantity of soil initially dry, vapor is introduced at a pressure below that required for saturation, a certain fraction of the molecules will condense into capillary masses of liquid enmeshed in the packing and the balance will be adsorbed on the parts of the total grain surface not covered by these masses."

A mathematical analysis of certain of the physical phenomena which may be assumed to take place in such a system occupies the remainder of the paper. The derivation of the integral form of the Kelvin equation relating the equilibrium curvatures of capillary surfaces of liquid masses with their vapor pressures is shown in an appendix.

Bagasse and paper mulches, O. C. MAGISTAD, C. A. FARDEN, and W. A. BALDWIN (*Jour. Amer. Soc. Agron., 27 (1935), No. 10, pp. 813–825, figs. 5*).—The work here reported from the Hawaiian Pineapple Producers' Experiment Station consisted in the preparation of 2 years' continuous records of soil temperatures under the mulches, of soil moistures, nitrates, and ammonia determined periodically, and of pineapple fruit yields obtained at harvest time, used to measure the efficiencies of the various mulches. The following conclusions were reached:

"The annual mean range between the maximum and minimum temperatures was one-half as great under bagasse as under paper, that for the no-mulch plats being less than that under paper. Soil moistures were highest in bagasse-treated plats, followed by papered and no-mulch plats. The first 6 in. of soil contained significantly less moisture but more nitrate than soil at greater depths. Nitrate content of the soil was greater in paper treatment than in the bagasse treatment or soil alone. Fruit yields were highest in bagasse-treated plants. Lack of sufficient nitrogen was a limiting factor for maximum fruit production."

A practical antimony electrode for soil pH determination, C. J. SCHOLLENBERGER (*Soil Sci., 41 (1936), No. 2, pp. 125–129, fig. 1*).—This contribution from the Ohio Experiment Station presents in working detail the design of a form of cast rod antimony electrode in a syringe-like protective mantle and describes the technic of rapid pH measurements on soil suspensions. The essential principle is that of a practically simultaneous standardization in a suitable buffer of known pH, in recognition of the fact that when used in this manner the potential pH relation of the antimony electrode is not absolutely constant, but the sensitivity to changes in pH and the constancy in character-

istics over short periods, even with change from one solution to another, were found sufficient for determinations of satisfactory accuracy.

With regard to the factor 0.000198322 T, common to all electrode equations, and indicating the effect of temperature upon the relation between differentials in potential and pH, or $dE/d\text{pH}$, it is suggested that as this "does not always have the theoretical, or even a constant, value over the entire pH range for the cast rod antimony electrode, it will probably be more accurate to standardize the electrode in two buffers, as closely as possible bracketing the pH of the sample. Then the observed value of $dE/d\text{pH}$ may be substituted:

$$dE/d\text{pH}=\frac{E_{B_1}-E_{B_2}}{\text{pH}_{B_1}-\text{pH}_{B_2}}, \text{ and } \text{pH}_X=\text{pH}_B-\frac{E_B-E_X}{dE/d\text{pH}}.$$

In order to avoid confusion in calculation, the buffer with numerically greater pH value is designated B_1, the other B_2, and the soil sample X; the corresponding potentials (E) and pH values are designated by these subscripts."

Lysimeter investigations.—IV, Water movement, soil temperatures, and root activity under apple trees, R. C. COLLISON (*New York State Sta. Tech. Bul. 237 (1935), pp. 31, fig. 1*).—This fourth report upon a series of investigations previously noted (E. S. R., 70, p. 305) describes new lysimeter equipment at Geneva and takes up "water movement in the soil under apple trees with different forms of orchard soil management . . ., with minor stress placed on movement of nutrients, soil temperatures, and root activity.

"Wide variation was found to occur in the amount of percolate from different soil horizons and from replicate funnels in the same horizon. Certain characteristics inherent in this type of lysimeter and in the experimental set-up are discussed, which are thought to be, in large part, responsible for these variations. The plant cover on a soil was found to affect greatly the movement of water and its relation to natural rainfall. The concentration of electrolytes in the percolate was found to increase downward. The soil type probably accounts for this, since in the soil profile worked with here, lime and magnesia increase with depth. A difference in leachability of several forms of nitrogen was noted and could be detected in the percolate. The volume and conductivity of the percolate of the newer lysimeters are compared with those of the older type and some interesting relations discussed.

"Root activity in the apple tree was studied, especially during the so-called dormant season, and its relation to soil temperatures in various parts of the soil profile noted. Root elongation and therefore nutrient absorption and assimilation took place during periods when the air temperatures were below zero and apparently at soil temperatures not far from the freezing point."

Soil, field-crop, pasture, and vegetable-crop management for Delaware County, New York, I, IV ([*New York*] *Cornell Sta. Bul. 639 (1935), pp. 5–53, 85–88, pl. 1, figs. 26*).—Part 1 of this bulletin, Soil and Field-Crop Management, by A. F. Gustafson, considers briefly topography and drainage, climate, transportation facilities, markets, and the agriculture of Delaware County; discusses the soil areas under the heads Lackawanna soil area, Culvers-Walton silt loam area, and Lordstown-Canfield silt loam area; and takes up the comparative use of the land, the composition of soil types, soil erosion in Delaware County, and lime needs and crop adaptations of Delaware County soils. Alluvial soils and the Barbour, Canfield, Chenango, Chippewa, Colchester, Culvers, Holly, Lackawanna, Lordstown, Norwich, Otisville, peat, rough stony land, Schoharie, Tioga, Tunkhannock, Walton, and Wellsboro series are individually dealt with. Other topics are production and use of farm manure and fertilizer usage in Delaware County, fertilizer experiments, fertilizer recommended, rotation

of crops, recommended cropping plans and fertilization for grain and forage crops, recommended varieties and rates of seeding, and forests as a farm crop.

Part 4 consists of Soil Map and Soil Type Descriptions, by C. S Pearson, F. B. Howe, and A. F. Gustafson. Parts 2 and 3 are dealt with on pages 40 and 46.

The carbohydrate-nitrogen relation in symbiotic nitrogen fixation, P. W. WILSON (*Wisconsin Sta. Res. Bul. 129 (1935), pp. 40, figs. 10*).—Continuing earlier work (E. S. R., 69, p. 183), the author introduced into the environment of inoculated leguminous plants numerous changes whereby variations in the Ch:N (carbohydrate:nitrogen) relation in the plants were effected. These changes included variations of the pCO_2, pO_2, and pN_2 of the atmosphere supplied the inoculated plants, of the length of day, the intensity of light, the strains of organism used for inoculation, and of the time of inoculation; and the addition of combined nitrogen.

"The resulting diverse types of experiments provide evidences which indicate that a given carbohydrate-nitrogen balance in the plant will condition a more or less specific response in the following functions of the symbiotic nitrogen fixation process: Number, size, and distribution of the nodules; quantity of nitrogen fixed; onset and duration of the nitrogen hunger stage; and response to light, fixed nitrogen, and other environmental conditions. In general, a given response is independent of the experimental conditions used to modify the Ch:N relation in the plant."

The observations here recorded are shown to support a general hypothesis with regard to the relation of the carbohydrate:nitrogen ratio to nitrogen fixation in leguminous plants which is summarized in the following paragraph:

"Defining the 'normal' plant as one grown in a nitrogen-free substrate, otherwise adequately supplied with plant nutrients, inoculated with an efficient strain of the proper organism, and given adequate but not excessive CO_2 and light, plants may be differentiated with respect to composition into five classes. These together with certain responses are: (1) Low carbohydrate-low nitrogen: Invasion of the plant, development of nodules, and fixation of nitrogen are decidedly restricted. In this class the absolute quantities of both nitrogen and carbohydrate are low, but the percentage of nitrogen is high. (2) Medium carbohydrate-low nitrogen: Invasion of plant is increased, development of nodules and fixation of nitrogen are stimulated unless environmental factors other than Ch:N balance restrict uptake of nitrogen. Since assimilation of CO_2 and nitrogen are in balance, and since photosynthetic activity is high, the greatest fixation of elemental nitrogen will occur in plants of this group. (3) High carbohydrate-low nitrogen: Invasion of plant is favored, but development of nodules and fixation of nitrogen are inhibited to some extent. (4) Low carbohydrate-high nitrogen: Invasion of plant, development of nodules, and fixation of nitrogen are inhibited. (5) High carbohydrate-high nitrogen: Invasion of plant, development of nodules, and fixation of nitrogen are favored in comparison with plants of class (4). In this class the absolute quantities of both carbohydrate and nitrogen are high; the percentage of nitrogen may vary.

"The hypothesis affords a unified biochemical explanation for many observations previously restricted to empirical description and throws light on certain agricultural practices."

The origin and significance of ammonia formed by Azotobacter, D. BURK and C. K. HORNER (*Soil Sci., 41 (1936), No. 2, pp. 81–122, figs. 4*).—An extensive investigation of the U. S. D. A. Bureau of Chemistry and Soils is here reported in full. A part of the specific findings are as follows:

"Under optimum conditions *Azotobacter* liberates aerobically a maximum of 50 percent of its cell nitrogen as ammonia and anaerobically a maximum of 10 percent. The optimum pH is 7.8 to 8.0, with a very broad, effective range exceeding the limits of pH 5 and 10. The optimum temperature is 30° to 40° C., with a very broad range exceeding 10° and 50°. The presence of N_2 gas for extensive ammonia formation is totally unnecessary once the cell nitrogen has been formed. H_2 is likewise inert. The influence of O_2 in oxidation of cell material is independent of the pressure between 0.01 to 1 atmosphere. By far the most important factor for optimum ammonia formation is elimination of oxidizable substrate from the medium, either slowly by respiration or quickly by mechanical separation (centrifugation). Most oxidizable organic matter inhibits the formation of ammonia completely at the low concentration of 0.03 percent or less. Upon quick mechanical removal of substrate from the growth medium of cultures of whatever appearance or age (1–30 days), ammonia formation sets in immediately and, under optimum conditions, without lag in rate. The time course follows a first order (logarithmic) course, with a specific rate of decomposition of 2 percent of the transformable cell nitrogen per hour (1 percent of the cell nitrogen), with only about a day required to obtain half of the final, maximum possible decomposition. The process of aerobic ammonia formation is at all times closely related to the oxidation of cell material, corresponding approximately to protein oxidation, since with ammonification carried to completion, the respiratory quotient (CO_2 produced/O_2 consumed) is 0.8 to 0.9 and 4.5 mols of O_2 are consumed per mol of NH_3 formed. Ammonia formation and oxidation of cell material in the absence of substrate follow the same general time courses and show a remarkable degree of correlation in relation to inhibition by a large number of agents, including toluene cyanide, very high nitrate concentration, very low oxygen pressure (below 0.01 atm.), pasturization, adverse pH, and adverse temperature. Inhibition by added organic matter (sugars, organic acids) may be divided into three classes—substrates themselves oxidized and inhibiting both ammonia formation and oxidation of cell material, substrates not oxidized but nevertheless inhibiting these processes, and substrates not oxidized and not inhibiting. The simultaneous inhibition of both ammonia formation and cell oxidation ordinarily occurs, for any given organic substrate, over the same concentration range, which, for the first substrate class, is usually 0.01 to 0.03 percent and, for the second substrate class, 1 to 10 percent.

"The over-all process of anaerobic formation of ammonia is hydrolytic, and carbon dioxide is normally not formed. Anaerobically there is no inhibition by toluene or (so far as tested) by any of the three classes of organic substrates mentioned in connection with aerobic inhibition. Cultures grown previously in fixed nitrogen, such as nitrate, ammonia, peptone, urea, asparagine, glutamate, adenine, creatine, or alanine, and then transferred to an environment containing neither fixed nor free nitrogen (the latter replaced by hydrogen gas) yield ammonia quantitatively in essentially the same manner, both aerobically and anaerobically, as cultures grown with N_2. This broad finding, in particular, shows that the mere occurrence of ammonia in cultures of *Azotobacter* grown in N_2 cannot be regarded as critical evidence in favor of a view current that the ammonia observed is derived, either wholly or in any part, specifically and directly from N_2."

Oxidation of sulphur in Arizona soils and its effect on soil properties, W. T. McGeorge and R. A. Greene (*Arizona Sta. Tech. Bul. 59 (1935), pp. 297–325, figs. 6*).—An examination of several typical Arizona soils indicated a very active sulfur-oxidizing flora.

Within the usual particle size limits of agricultural sulfur the coarse-grained material gave practically as good an oxidation as did the finer and more expensive grades. The oxidation of 1 ton per acre was very rapid and was usually complete in 2 or 3 weeks at optimum moisture content and temperature. From 2 to 10 tons of sulfur per acre had a more prolonged and more pronounced effect upon the soil. In every case the oxidation of sulfur was accompanied by increases in soluble salts, calcium, sulfates, potassium, and phosphate, and by a decrease in pH and in the soluble nitrate content of the soil. Percolation experiments showed that the physical condition of the soil had been improved by sulfur oxidation. The percolates from the sulfured soils were also higher in soluble salts content than were those from the untreated soils.

"There is a very active production of carbon dioxide during sulfofication in Arizona soils. Apparently some of the sulfuric acid formed neutralizes some of the calcium carbonate, liberating gaseous carbon dioxide. Sulfur is a very efficient agent for reducing the alkalinity of Arizona soils, for improving their physical condition, and for increasing the availability of calcium, phosphorus, and potassium. Since there is an increased production of carbon dioxide it can be well recommended as a substitute for organic matter."

It was shown by means of the Neubauer method (E. S. R., 53, p. 319) and by pot experiments that the availability of phosphate and potassium in the soils and their absorption by plants in alkaline calcareous soils is greatly increased by sulfur treatment.

An appendix records some previously unpublished data obtained by C. N. Catlin and S. P. Clark in 1922 in experiments on the use of byproduct sulfuric acid from sulfide ore smelters in the reclamation of alkali soils.

Further work with the Cunninghamella plaque method of measuring available phosphorus in soil, A. MEHLICH, E. B. FRED, and E. TRUOG (*Jour. Amer. Soc. Agron., 27 (1935), No. 10, pp. 826–832, fig. 1*).—At the Wisconsin Experiment Station a special clay culture dish has been designed for conducting the *Cunninghamella* test (E. S. R., 72, p. 745) for available phosphorus of soils. This dish has the advantage of being more durable than the small glass Petri dish, and its use has made the results more accurate and satisfactory. The new dish was used in testing a great variety of soils, and the results obtained agreed quite satisfactorily with crop yields in the field and with the results of the Neubauer and chemical methods.

The culture soil is placed in a glazed circular depression, 23 mm in diameter and 7 mm deep, centrally placed in a circular block of dark colored unglazed clay having a porosity of from 8 to 10 percent, the outer dimensions having a diameter of 55 mm and a height of 15 mm. "The surface of the cavity is glazed so as to be waterproof, but the rest of the slab is unglazed . . . so that it will hold moisture and thus promote the growth of the fungus uniformly over its surface. The surface of the unglazed portion of the dish is of dark color, such as dark red, in order that it may serve as a good background against which the white mycelium may be easily seen."

The biological effect of available phosphorus in Hawaiian soils, A. F. HECK (*Jour. Amer. Soc. Agron., 27 (1935), No. 10, pp. 847–851, fig. 1*).—The author of this contribution from the Wisconsin Experiment Station reports upon three plat experiments on which the fertilizers used were, respectively, 1,500 lb. per acre of sodium nitrate, the same plus 10 tons of waste molasses, and the same quantities of sodium nitrate and waste molasses plus 6 tons per acre of rock phosphate. The crop was sugarcane. The plats were located at the Waipio Substation of the Hawaiian Sugar Planters' Experiment Station.

"In the presence of available energy material, the biological activity in Hawaiian laterites is greatly stimulated by the presence of available phosphorus, when measured by the assimilation of nitrate nitrogen by microorganisms. In this combination with energy material, phosphorus helps prevent leaching of mineral nitrogen and also helps to build up a larger biological balance in the soil, which in turn increases the amount of phosphorus as well as nitrogen held in the organic form, thus increasing the availability of the phosphorus."

Immediate effects of fertilization upon soil reaction, C. B. CLEVENGER and L. G. WILLIS (*Jour. Amer. Soc. Agron., 27 (1935), No. 10, pp. 833–846, figs. 7*).—Work on the early neutralizing effect of the organic ammoniates, cottonseed meal, and urea, in comparison to that of dolomitic limestone used at rates calculated to produce a nonacid-forming fertilizer, is reported from the North Carolina Experiment Station, together with results considered to indicate that "the value of natural organic ammoniates as they are used in mixed fertilizers does not lie solely in the property of becoming available slowly and furnishing a supply of nitrogen throughout the growing season. An important function of the whole group of organic ammoniates, including urea, is to accomplish the prompt neutralization of the acidity developed upon the addition of a fertilizer to the soil."

Analyses of commercial fertilizers, fertilizer supplies, and home mixtures for 1935, C. S. CATHCART (*New Jersey Stas. Bul. 597 (1935), pp. 31*).—This bulletin contains the analytical data of the greater part of the State fertilizer inspection of 1935. In the cases of unmixed fertilizer materials the average retail cost per pound of nitrogen, of available phosphoric acid, or of potash, respectively, is given for sources of which the selling price could be ascertained.

Analyses of commercial fertilizers and ground bone; analyses of agricultural lime, 1935, C. S. CATHCART (*New Jersey Stas. Bul. 600 (1935), pp. 16*).—This bulletin reports upon the 1935 fertilizer analysis data not included in Bulletin 597, above noted, and upon analyses of agricultural liming materials. The bulletin discusses also the character of the fertilizer elements in mixed fertilizers, commercial valuations, the calculation of commercial valuation, the cost of plant food in commercial fertilizers, and the wholesale prices of essential elements of plant food, 1935.

AGRICULTURAL BOTANY

[Botanical studies by the Iowa Station] (*Iowa Sta. Rpt. 1935, pp. 74, 83*).—Progress reports are given on the fermentation products formed by the action of certain fungi on the byproducts of the corn plant (largely the development of methods), by J. C. Gilman and C. H. Werkman; and on the distribution and ecology of plants significant to wild waterfowl in their breeding grounds in northern Iowa, by A. Hayden.

The seasonal changes in starch and fat reserves of some woody plants, O. ISHIDA (*Mem. Col. Sci., Kyoto Imp. Univ., Ser. B, 11 (1935), No. 1, pp. 1–53, figs. 14*).—The observations here recorded were made on five deciduous and two evergreen species of trees in Kyoto, viz, *Castanea pubinervis, Alnus japonica, Robinia pseudoacacia, Tilia miqueliana, Populus nigra, Quercus glauca,* and *Pinus densiflora.* In all cases both aerial and underground portions were investigated.

Growth and seasonal changes in composition of oak leaves, A. W. SAMPSON and R. SAMISCH (*Plant Physiol., 10 (1935), No. 4, pp. 739–751, figs. 4*).—

This study from the University of California embraces a record of chemical composition in relation to physiological stages of growth of leaves of several western species of oak (*Quercus*), the results being expressed on the basis of dry weight and unit leaf area and also on an absolute basis of leaf area. A large amount of protein accumulated in the leaf early in the season. Although no more nitrogen was taken up, leaf expansion continued, resulting in a reduction in protein content per unit area. Most of the crude fiber was accumulated early in the growth cycle. Ether-soluble substances accumulated continuously through the growing season, whereas the nitrogen-free extract increased rapidly in some species, remaining almost constant thereafter, and in others continued to accumulate gradually until September. Calcium and silica increased rapidly throughout the growing season, whereas potassium and phosphorus showed a rapid rise in the spring and a declining increase during the summer. The importance of expressing the chemical composition on the basis of a specific organ, such as a leaf or the plant as a whole, is emphasized.—(*Courtesy Biol. Abs.*)

Some chemical aspects of calcium deficiency effects on Pisum sativum, D. DAY (*Plant Physiol., 10 (1935), No. 4, pp. 811–816*).—Peas were grown in sand cultures with seven nutrient solutions, each varying in the proportion of calcium nitrate ($Ca(NO_3)_2$). Fresh and dry weights, after 5 weeks, were greatest for the plants given the most Ca, almost as much for those given the half ration, and decidedly less for those starved of Ca. The percentage of dry matter in the shoots was greatest in the plants starved of Ca, with the reverse true for the roots. Chemical analyses showed that plants starved of Ca had, after 5 weeks, almost one-third as much Ca as those grown in the complete nutrient solution. The amount of Ca in the plants varied with different substitutions for $Ca(NO_3)_2$. There was no consistent variation in the proportion of stored Ca to fresh or dry weights.—(*Courtesy Biol. Abs.*)

Effect of titanous chloride on the formation of chlorophyll in Zea mays, O. L. INMAN, G. BARCLAY, and M. HUBBARD (*Plant Physiol., 10 (1935), No. 4, pp. 821, 822, fig. 1*).—When maize was grown in water cultures made up with 0.001 M K_2HPO_4, 0.002 M KNO_3, 0.001 M $Ca(NO_3)_2$, and 0.001 M $MgSO_4$, both with and without iron and with titanous chloride ($TiCl_3$) as a substitute for iron, in no case was there evidence of chlorophyll formation in the absence of iron.

Effect of vitamin C (ascorbic acid) on the growth of plants, S. v[ON] HAUSEN (*Nature [London], 136 (1935), No. 3439, p. 516*).—The dry weight of treated plants was about 35 to 75 percent higher and the content in vitamin C much greater in the plants receiving vitamin C in the nutrient solution.

The flavine enzyme systems in germinating plants [trans. title], H. v[ON] EULER and O. DAHL (*Biochem. Ztschr., 282 (1935), No. 3–4, pp. 235–241*).—Investigating barley, oats, and peas, it was found that during the first 5 days of germination barley contained about three to seven times the total amount of flavine in oats. At 2 days the total flavine synthesis in barley was essentially completed, in contrast to oats in which this process continued longer. In extracts of germinated seeds the ratio of nondialyzable (combined) to total flavine was about 2:3, and this relation held fairly constantly throughout germination. In nongerminated peas, which in contrast to nongerminated barley and oats contained a considerable amount, the flavine was almost all (94 percent) in the combined form.

Some effects of radioactive mud upon germination of seeds and growth of seedlings, L. HAVAS (*Jour. Agr. Sci. [England], 25 (1935), No. 2, pp. 198–216, pls. 2, figs. 6*).—"Stimulatory effects upon germination and growth were

observed in a very wide range of dosages upon exposing seeds and seedlings to the radiation from a radioactive mud of Hungarian origin. Emanation was not excluded, but interposed lead sheet practically abolished the significant differences. Stimulation was observed whether the seeds were placed directly in contact with, or at a little distance from, all but the largest amounts of mud. Treatment of seeds, before sowing, with the radiation from large amounts of mud for periods exceeding about 48 hr. was harmful to germination and to growth; this harmful effect was more marked when the seeds were moistened.

"The degree and the kind of stimulation varied with the kind of seed and its history. Wheat seeds treated with vital stains showed responses to irradiation which appeared to depend upon the stain."

The fluctuations of sugars in the leaf blades of the sugar cane plant during the day and the night, C. E. HARTT (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *39 (1935), No. 4, pp. 298–326, figs. 6*).—In this initial paper of the series the author first gives a historical review of the literature on carbohydrate formation in sugarcane and other plants. For the original investigations, preliminary in nature, sugarcane leaves (variety H 109) were collected at hourly and bihourly intervals during both day and night and subjected to analyses for sugars, moisture, starch, and total polysaccharides.

Definite fluctuations in moisture content occurred in all experiments, the least water occurring at from 1 to 3 p. m. (usually the time of greatest solar radiation), after which it increased rapidly until from 6 to 7 p. m., when the moisture curve leveled off. This cessation in rise probably coincided with the time of stomatal closure. In certain respects the moisture curves were related to those for the polysaccharides, which may indicate the utilization of water in their hydrolysis. Rainfall seemed to have no important effect on the general water level in the blades, but there was an inverse relation between their water content and the age of the plant. Probably both season and age influence the water content.

Sucrose reached a minimum in the early morning, but it might begin to increase an hour before or after dawn or might show no appreciable increase even at 8 a. m. Thus some factor other than light seems to affect the time in the morning when sucrose begins to increase in the leaves. The simple (reducing) sugars occurred in much smaller amounts, and the results raised many questions regarding their curves. Starch showed an increase during the day and a decrease at night. The polysaccharides increased during the day and decreased at night.

As to which sugar is first formed in photosynthesis, it is believed impossible at present to give a definite answer, but various speculations with arguments pro and con are presented. It is concluded that the carbohydrate constituents of sugarcane blades are interrelated, that they fluctuate in concentration during the day and night, and that a study of these fluctuations may aid in elucidating some of the difficult problems in the physiology of the sugarcane plant and thus offer ultimate practical applications.

Effect of narrow ranges of wave-lengths of radiant energy and other factors on the reproductive growth of long-day and short-day plants, N. A. SCHAPPELLE ([*New York*] *Cornell Sta. Mem. 185 (1936), pp. 33, figs. 17*).—Red and blue lights were about equally effective in inducing the reproductive growth response in radish, spinach, *Crepis*, and *Marchantia*. Blue light was superior to red in causing flowering in lettuce, probably due to the better effect of blue light on the plant as a whole. The red light stimulated flowering, but the plants were too weak to complete the flower development. Infrared was ineffective for inducing fruiting in *Marchantia*. When the intensity of natural

light during winter was increased (especially with the use of red or blue light), normally long-day plants such as radish or *Marchantia* could be forced into fruiting in a 10-hr. day. At low light intensities the fruiting response in *Marchantia* was proportional to the increase in intensity.

Temperatures of from 10° to 20° C. tended to aid the initiation of reproductive growth in the plants tested, but more vigorous vegetative growth occurred at from 25° to 30°.

Mineral nutrients (especially nitrates) tended to delay reproductive growth in the plants used, but when they made the plant more vigorous the total flowering response, if initiated by proper light treatment, eventually became greater.

Aster and early flowering cosmos, though short-day plants, were not extremely sensitive to the photoperiod and flowered even in a long day if the light intensity was not too great. Red light proved superior to blue for flowering in such plants regardless of length of exposure, but blue light did not completely inhibit flowering. *Salvia, Chrysanthemum, Kalanchoe,* Maryland Broadleaf tobacco, and teosinte were extremely sensitive to the photoperiod, not flowering at any of the long-day exposures. Five hr. of daylight immediately followed by 5 hr. of red light or 10 hr. of daylight daily induced a good flowering response in these plants, but a short day of 5 hr. of daylight and 5 hr. of blue light almost completely inhibited flowering.

Short-day plants are probably prevented from flowering in summer both because of the long photoperiod and because of the high intensity of the blue light. On the other hand, long-day plants fail to flower in winter both because of the short photoperiod and because of the low light intensity, especially of the blue light.

Either end of the spectrum, when given in the complete absence of the other, caused abnormal growth and injury. In this respect blue light seemed to be more injurious than the red for all plants tested except lettuce.

The methods used for the physical measurements and for the culture of the plants are described in detail.

The reactions of plants to ultra-violet, E. S. Reynolds (*Ann. Missouri Bot. Gard., 22 (1935), No. 4, pp. 759–769*).—This review constitutes a discussion of general considerations relative to the subject.

Studies in ultra-violet and respiratory phenomena, I–III (*Ann. Missouri Bot. Gard., 22 (1935), No. 4, pp. 771–860, figs. 13*).—The following three sections are included here:

I. *Review of work published before June 1935,* F. L. Wynd and E. S. Reynolds (pp. 771–835).—The subject matter is discussed under basal metabolism of animals, metabolism of plants, oxidizing enzymes, and sulphydryl compounds, and from this review it is concluded that ultraviolet light has a general destructive effect on oxidizing enzymes in vitro, with the exception of xanthine oxidase. The three classes—invertase, catalese, and rennet—are recognized, but the exact nature of their differences is considered still unknown. The various degrees of injury reported by different workers are not to be considered as inconsistent, since there are many complex factors operating to give the final effect. This is particularly true of studies in vivo. It is not deemed possible at present to analyze the effect of ultraviolet light on respirational metabolism into its various components. An 8-page bibliography is appended.

II. *The effects of ultra-violet on respiration and respiratory enzymes of higher plants,* F. L. Wynd, H. J. Fuller, and E. S. Reynolds (pp. 837–852).—In tomato plants exposed to a mercury arc under various conditions injurious

irradiation stimulated respiration and peroxidase, oxygenase was inhibited, and catalase reacted variously but, in general, was stimulated. The most pronounced effect of noninjurious irradiation was a great stimulation of the catalase.

In bean plants comparatively weak doses induced chiefly a greatly stimulated peroxidase. These plants failed to exhibit oxygenase activity, indicating a different chemical physiology consistent with their different reactions to irradiation.

"The comparative activities of peroxidase and oxygenase show that the oxygenase-peroxide-peroxidase system . . . does not represent a fundamental respiratory mechanism in the tomato plant."

III. *The influence of various regions of the spectrum on the anaerobic fermentation of yeast*, E. S. Reynolds and F. L. Wynd (pp. 853–860).—The data obtained indicated that ultraviolet light between 3,000 and 2,500 a. u. has an inhibiting effect on the fermentative activity of suspensions of 2-hr. cultures of baker's yeast in the Pasteur medium. This is a specific effect not depending on a general injury to the cell. The degree of inhibition is both a qualitative and a quantitative function of the ultraviolet light. Irradiations of longer wavelength than 3,000 a. u. were without effect.

Kinetics of an intracellular system for respiration and bioelectric potential at flux equilibrium, G. Marsh (*Plant Physiol., 10 (1935), No. 4, pp. 681–697, figs. 4*).—The inherent electromotive force of a living cell is formulated in terms of the velocity of cell oxidation at flux equilibrium. The oxidizable substance (reductant) is formed reversibly from its precursor, and its conversion to oxidant depends on oxygen pressure. The potential at a single locus in the cell is a direct function of the oxygen pressure and the velocity constants of the respiratory reactions. A difference in reaction velocity at the two ends of a cell accounts for the electrical polarity and its dependence on oxygen pressure. The cell with the higher rate of oxygen consumption at constant oxygen pressure possesses the greater electromotive force and shows the greater increase in potential difference with increased oxygen pressure. This gives a theoretical foundation to the observed facts for polar tissues. The system will account for reversal of polarity with lowered oxygen pressure. A theoretical oxygen consumption-oxygen pressure equation is obtained which provides a good description of published data.—(*Courtesy Biol. Abs.*)

Mechanical stimulation and respiration rate in the cherry laurel, L. J. Audus (*New Phytol., 34 (1935), No. 5, pp. 386–402, figs. 12*).—The results of these studies with respiration chambers were in the nature of an exploration into the form and magnitude of the respiratory effect of mechanical stimulation as it occurs in the normal leaf, observations being carried out on the drift of the effect during starvation and its variation from leaf to leaf. It was first conclusively proved that the increase in respiration was due to the actual handling of the leaves rather than to environmental changes, both by eliminating the latter one by one and by mechanically stimulating the leaves without removing them from the respiratory chamber. A relatively small amount of stimulation gave a large effect, but a more vigorous bending or deformation of the leaf gave no further increase in the response.

A further series of tests was carried out to determine the form and magnitude of the respiratory effect of stimulating leaves at various times during their starvation life. Here two effects were found, the first being the normal stimulatory effect of increasing the respiration and the second a depressant effect. The latter was noted only during the senescent "hump" of the respiratory curve, and it is deemed probable that its appearance is intimately related to the senescence of the leaf. Successive stimulations at short intervals seemed

to indicate that there is the development of a fatigue after stimulation, resulting in a decreased response. The stimulatory rises showed a falling off as starvation proceeded, but there was a great variation in this stimulatory rise at comparable times on the drifts in leaves gathered at different times of the year. There was no correlation between the drift of these rises and the normal respiratory drift, apparently indicating that the stimulation is not acting on the gross respiration but on some part of the complex not following this gross respiratory drift. The falling off of the stimulatory rises with starvation was not of constant slope, but seemed to be more rapid at a time corresponding approximately with the onset of yellowing and of the senescent slump. These facts are believed to show that the effect of mechanical stimulation is independent of the pitch of the normal respiration and is affected only by the starvation life of the leaf and some intrinsic factor acting within the leaf. During senescence there is a much more rapid falling off of the stimulatory rises due (1) to the slow fall in the initial phases and (2) to the increase in the number of yellow and brown cells which have lost the power of response.

The effect of handling on the respiration of cherry laurel leaves, H. GOODWIN (*New Phytol., 34 (1935), No. 5, pp. 403–406, fig. 1*).—The results here reported for cherry laurel (*Prunus lauro-cerasus* [*Laurocerasus officinalis*]) (see also above) appear to show that handling of the leaves can cause a large increase in the subsequent respiration rate. The intrinsic interest of this factor, as well as its practical relation to the technic of respiration experiments, is stressed.

A note on the effect of handling on the respiration of potatoes, J. BARKER (*New Phytol., 34 (1935), No. 5, pp. 407, 408, fig. 1*).—Potato tubers with firm turgid flesh withstood the handling necessary in weighing and placing in a respiratory chamber without serious disturbances of their respiration. The respiration of soft potatoes was but little disturbed if compression during handling was avoided. The magnitude of the respiratory disturbance from handling is presumably related to the extent of the compression or deformation of the tissues.

Note on exudation and exudation pressures in birch, C. T. INGOLD (*New Phytol., 34 (1935), No. 5, pp. 437–441, figs. 2*).—"The evidence for birch, insofar as it exists at the moment, appears to support Atkins' view [E. S. R., 36, p. 429] of exudation pressures rather than the more recent theory of James and Baker [E. S. R., 70, p. 756]."

Osmotic pressure and water content of prairie plants, L. A. STODDART (*Plant Physiol., 10 (1935), No. 4, pp. 661–680, figs. 5*).—Studies were made of the osmotic pressure and water content of tissues in native species of the tall-grass prairie association near Lincoln, Nebr., with especial attention to these characteristics as a possible measure of drought resistance. The cryoscopic method was used for determining osmotic pressure of sap extracted from plants frozen in dry ice, and the water content of the tissues was determined on samples of about 50 gm dried at 80° C. for at least 48 hr. Osmotic pressure and water content of plant tissues were shown to be closely and inversely related and to be an expression of the environment, indicating the relative force with which the soil supplies water to the plant and the force with which the air removes water through transpiration. Osmotic pressure increased and water content decreased as the growing season progressed, the value of each depending closely on the availability of soil moisture. Great variation of these two physiological factors was not seen where soil moisture was maintained by artificial watering, where moisture was naturally maintained by topographical characteristics, or where the roots were so deep that moisture was always within reach. Artificial variation of both air humidity and soil moisture in the field indicated that both of these factors have a great

influence on the osmotic pressure and water content of tissues, and studies on day and night fluctuations also confirmed this relationship.

Osmotic pressure as a measure of drought resistance has probably been overstressed. Soil moisture and air humidity are the major habitat factors influencing osmotic pressure and water content of plant tissues. A low osmotic pressure and a high water content of plant tissues indicate a lack of water stress, due to plentiful soil moisture or favorable humidity—(*Courtesy Biol. Abs.*)

GENETICS

Wheat inheritance: Reaction to four bunt biotypes, spike density, and seed color, A. M. SCHLEHUBER (*Washington Sta. Bul. 323 (1935), pp. 32, figs. 5*).—The reactions of Albit, Minhardi, and Buffum 17 winter wheats and the F_2 progeny of Albit × Minhardi and Albit × Buffum 17 to four biotypes of bunt are described.

The F_2 progeny of both crosses were completely susceptible when inoculated with forms T–13 and T–2 to which both parents are susceptible, but a series ranging from immunity to complete susceptibility was found in the F_2 when inoculated with forms T–1 and L–5 to which Albit is immune and Minhardi and Buffum 17 are susceptible. In the F_2 generation of Albit × Minhardi the four classes, smut-free, intermediate resistant, intermediate susceptible, and susceptible, closely approximated a 7:4:4:1 ratio to T–1, indicating a two-main-factor difference. The correlation between T–1 and L–5, $r=0.956\pm0.008$, indicated that the same two main factors, A^1 and A^2, responsible for resistance to T–1 were also responsible for resistance to L–5. Minhardi introduced a factor *I* which inhibits the action of A^1 against L–5 but not against T–1. Neither Albit, Minhardi, nor Buffum 17 possesses genes for resistance to T–13 and T–2. Segregates more susceptible than Buffum 17 were found. It seemed possible that Buffum 17 carries a factor *C* which reduces the amount of bunt and an additional factor *Ib* which inhibits the action of both A^1 and A^2.

Data are also presented on the inheritance of spike density and seed color in Albit × Minhardi and Albit × Buffum 17. Albit, the dense parent, varied in spike density from 18 to 26 mm, with a mean of 22 mm, of 10 rachis internodes measured in the center of the spike; Minhardi from 46 to 58, with a mean of 50.5; and Buffum 17 from 52 to 60, with a mean of 55.8 mm. The F_2 segregations of the two crosses explain spike density on a single-factor difference. Minhardi and Buffum 17 each carry two dominant factors for red seed color; the results in both crosses indicated a two-factor difference approximating a 15 red: 1 white ratio in F_2. Comparison of the data on bunt reaction, spike density, and seed color indicated a possible weak linkage between smut resistance to T–1 and spike density and also between T–1 reaction and seed color.

Hybrid vigor in maize, E. ASHBY (*Amer. Nat., 70 (1936), No. 727, pp. 179–181*).—A comment on the article of Lindstrom (E. S. R., 73, p. 764).

Fertility, photoperiodism, and genetics of lettuce [trans. title], M. ERNST-SCHWARZENBACH (*Züchter, 8 (1936), No. 1, pp. 11–21, figs. 7*).—Although lettuce produces seed freely from self-pollination, the author reports that cross-pollination was easily accomplished. In 149 crosses between cultivated varieties all except 15 yielded seed. Species crosses of *Lactuca sativa* and *L. scariola* were successful, but no seed was secured from crosses of *L. scariola* and *L. verosa* or between *L. verosa* and cultivated varieties.

In day length experiments it was found that many varieties have distinct photoperiodic responses; for example, the early spring heading lettuces would

not form heads in midsummer but went directly to seed. Head formation in lettuce is believed to depend on a recessive factor which operates only when the factor for rosette formation is absent and that for early seed stalk formation is either not present or is rendered ineffectual by short days. The author believes that *L. scariola* is really a composite of several lesser species which may have arisen from *L. scariola* by mutation. Whether *L. sativa* is of purely *L. scariola* origin or arose from spontaneous hybrids of *L. scariola* with other species is considered questionable.

Inherited characters in the tomato.—II, Jointless pedicel, L. BUTLER (*Jour. Heredity, 27 (1936), No. 1, pp. 25, 26, fig. 1*).—Continuing the study (E. S. R., 68, p. 463), certain tomato plants growing in breeding experiments at the University of Toronto were found to lack the characteristic abscission joint of the pedicel. A study of the pedigree of these plants indicated that the jointless pedicel is a simple recessive character derived from the French variety Rouge naine hative, and subsequent breeding studies indicated that the character is closely linked with leafy inflorescence in the fifth chromosome.

A seeded mutation of the Panariti grape, F. N. HARMON and E. SNYDER (*Jour. Heredity, 27 (1936), No. 2, pp. 76–78, fig. 1*).—In the season of 1934 one shoot of a Panariti vine growing in the U. S. D. A. Experiment Vineyard at Fresno, Calif., produced two perfect clusters of large berries with seeds. Search in commercial Panariti vineyards revealed similar variations, and since the mutant forms are commercially undesirable the authors advise that mutant canes, vines, or shoots should be systematically eliminated.

Artificial control of nucellar embryony in citrus, H. P. TRAUB (*Science, 83 (1936), No. 2146, pp. 165, 166*).—Stating that the tendency to produce supernumerary nucellar embryos is a serious handicap to an effective study of the progeny in citrus breeding experiments, the author discusses a method of reducing nucellar embryo formation by limiting the available food supply to the fruit by cutting down the leaf area and by shading. The progeny from treated self-pollinated grapefruit and sour oranges segregated for leaf characters, indicating that the seedlings were in most cases apparently of seminal origin.

The chromosome number in Gladiolus, R. BAMFORD (*Jour. Agr. Res. [U. S.], 51 (1935), No. 10, pp. 945–950, fig. 1*).—Using chiefly root tip materials, the author, in these studies at the Maryland Experiment Station, determined the chromosome numbers in various species, species hybrids, and commercial varieties. He found that the genus *Gladiolus* is heteroploid with a basic number of 15 chromosomes. The majority of the species studied were diploid, the only exceptions being members of the subsection Dracocephali and the European-Asiatic group. The chromosomes were small and generally of the same size, irrespective of number. Occasionally, but not consistently, there were detected two or four large chromosomes. A brief discussion of the possible origin of tetraploid forms of *Gladiolus* is presented with relation to their botanical antecedents.

Inheritance of doubleness in the flowers of the nasturtium, W. H. EYSTER and D. BURPEE (*Jour. Heredity, 27 (1936), No. 2, pp. 50–60, figs. 8*).—Briefly discussing the probable origin of the double flowered form of nasturtium, the authors report the discovery in the progeny of crosses of the golden-flowered double nasturtium with colored singles of a large superdouble form having in the opening stage the general aspect of a large-flowered pansy and in the fully expanded stage that of a large double carnation. This extreme doubleness was inherited as a dominant characteristic over both singleness and the ordinary type of doubling.

A lethal gene in Jersey cattle, C. WIPPRECHT and W. R. HORLACHER (*Jour. Heredity, 26 (1935), No. 9, pp. 363–368, figs. 3*).—An inherited lethal condition, resulting in semihairless areas on the animal, and other defects which are lethal are described. Seven abnormal calves were produced by the progeny of one bull. An interesting observation was made regarding a heterozygous bull which, in 20 matings with daughters of heterozygous bulls, produced only normal calves.

An inherited skin-defect in cattle: The occurrence of a sub-lethal epithelial defect in a Jersey herd, and a plan for eliminating lethal genes, W. M. REGAN, S. W. MEAD, and P. W. GREGORY (*Jour. Heredity, 26 (1935), No. 9, pp. 357–362, figs. 4*).—Four Jersey calves presenting a semihairless condition, appearing in an inbreeding experiment at the California Experiment Station, are described. All calves were born early, and there was no skin below the knees or hocks, around the eyes, or on the muzzle. The character is sublethal and considered to be the same as the one described by Hadley (E. S. R., 59, p. 823). Other abnormal conditions were noted. The abnormal calves were all sired by one bull mated to his half sisters.

Methods for testing cows and bulls for the presence of lethals are described. The methods being followed in purging the herd of the hairless character are taken as an example.

[Genetic investigations with sheep and goats] (*Texas Sta. Rpt. 1934, pp. 28–30*).—Attempts by B. L. Warwick are reported to increase the number of progeny per female by injecting does with Antuitrin S. Data are also noted as to the polled character in Rambouillet sheep and cryptorchidism, thought to be associated with it, by Warwick, J. M. Jones, W. H. Dameron, and P. B. Dunkle; and cytological studies involving hybridization of sheep and goats, by Warwick, R. O. Berry, and W. R. Horlacher.

Polydactyly in swine, E. H. HUGHES (*Jour. Heredity, 26 (1935), No. 10, pp. 415–418, figs. 3*).—Thirteen cases of an extra toe on the forefeet of Duroc Jersey swine were observed among 125 offspring produced by closely related parents at the California Experiment Station. The mode of inheritance was not determined except that it occurred on both males and females in about equal proportions.

Dominant dilution and other color factors in Collie dogs, A. L. MITCHELL (*Jour. Heredity, 26 (1935), No. 10, pp. 425–430, figs. 3*).—Studies of the inheritance of colors in Collies show that three primary factors are concerned, (1) spotting, *s*, (2) black and tan, a^t, and (3) a semidominant dilution factor, *M*. The presence of white spotting indicates that Collies are homozygous for *ss*. The tricolor is a^ta^tss. The dilution gene *M*, when homozygous, gives almost complete white, pale eyes more or less sightless, and defective hearing. The heterozygote gives merle.

Inter se matings of blue merles produced 20 whites, *MM*, 39 blue merles, *Mm*, and 20 tricolored, *mm*, progeny.

The harlequin pattern of the Great Dane is due to an independent modifier of the dilution factor *M*.

Sable is due to a dominant factor A^v, allelomorphic to A^t for black and tan and *A* for agouti. The character of sable depends on the genotype.

Another factor for white, *w*, also exists in Collies and gives normal white Collies with dark eyes and points.

A new sub-lethal colour mutation in the house mouse, H. GRÜNEBERG (*Roy. Soc. [London], Proc., Ser. B, 118 (1935), No. 809, pp. 321–342, pls. 3, figs. 12*).—A simple recessive, autosomal, lethal gene called "gray-lethal", observed in the progeny of mice heterozygous for the extreme dilution factor C^D—an allel of wild type—is described. The gene was found to suppress the

formation of yellow pigment. After a preliminary growth period weight increases ceased, and later there was a loss in weight with death finally occurring at 22 to 30 days. "Gray-lethal" animals were smaller at birth and calcification was faulty, resulting in abnormalities in bone formation and the failure of the teeth to appear. Life was prolonged up to 42 days by supplying finely ground feeds and milk after weaning; nevertheless, development was arrested.

Other tests were made of the influence of prolonged nursing without much effect on the increase in the length of life.

Detailed anatomical, histological, and X-ray studies of bone formation showed poor development of periosteal bone and incomplete calcification.

[Studies of the physiology of reproduction in sheep and swine] (*Missouri Sta. Bul. 358 (1935), pp. 17–20*).—Continuing studies previously noted (E. S. R., 72, p. 464), the results of investigations are briefly reported as follows: The development of the tunica dartos muscle in the sheep fetus, by F. F. McKenzie and R. W. Phillips; comparison of the corpora lutea of pregnancy with the corpora lutea in nonpregnant ewes, by V. Warbritton; studies of bringing ewes into oestrum during June, July, and August with preparations of Antuitrin S (pregnancy urine), whole serum, and acetone precipitate of whole serum from pregnant mares, descriptions of parturition in the ewe and sow and conditions associated therewith, and correlation of the condition of the afterbirth and thrift and condition of the lamb, all by McKenzie and R. Bogart, the time of ovulation in the sow, by McKenzie and C. E. Terrill; and the rate of migration of spermatozoa through the genital tract of the sow following mating, by McKenzie, Terrill, Warbritton, and L. J. Nahm.

Report of the second conference on the standardisation of sex hormones (*League Nations Health Organ. Quart. Bul., 4 (1935), No. 3, pp. 618–630*).—The resolutions adopted at the second conference, held in London, on the standardization of the male and female sex hormones and the progestational hormone of the corpus luteum are given.

The corpus luteum of pregnancy in relation to the anterior pituitary gland, M. Feeesten (*Endocrinology, 19 (1935), No. 4, pp. 407, 408*).—As positive Aschheim-Zondek tests were obtained for 39 days after the removal of a corpus luteum of pregnancy from a woman, the positive pregnancy test does not seem to be dependent on the corpus luteum hormones.

Cows' milk as a possible excretory source of the anterior pituitary-like hormone, A. I. Weisman, I. S. Kleiner, and E. Allen (*Endocrinology, 19 (1935), No. 4, pp. 395–397*).—The amount of anterior pituitary-like hormone, if any, in skim milk from a mixed group of cows or from a cow pregnant from 6 to 7 mo. was insufficient to give a positive test when 0.3 cc were injected into immature female mice on 4 successive days.

Quantitative studies on the reaction of the anterior pituitaries of immature female rats to extracts of pregnancy urine, J. M. Wolfe (*Endocrinology, 19 (1935), No. 4, pp. 471–477*).—Study is reported on the reactions of immature 21-day-old female rats to 5 and 10 daily injections of 25 units of pregnancy urine extract as compared with animals receiving 1 dose or none of the extract. The results showed that the nature of the reaction in the ovary and pituitary was due in part to the period of injection. One injection produced ovaries with a few mature follicles and corpora lutea, and cornified vaginas, with a slight increase in the weight of the pituitaries and degranulation of the basophiles. There was increased weight of the ovaries with many large follicles and corpora lutea, cornified vaginas, and increased weight of the pituitaries with definite granulation of basophiles and a slight granular loss of eosinophiles

from those treated with 5 doses. These conditions were still more evident in the rats treated with 10 daily doses.

Effects of pregnancy urine administration to female swine, E. P. TSCHERNOZATONSKAJA (*Endocrinology, 19 (1935), No. 4, pp. 413, 414*).—The administration of pregnancy urine in doses of from 10 to 20 cc every 2 or 3 days to swine 4 to 5 mo. old was found to increase the average daily rate of gain 115 g per day as compared with the gains of a control group. The treatment caused permanent inhibition of sex activity and degeneration of the ovaries, but the carcass weight and amount of fat on the carcass was greater.

On the comparative luteinizing capacity of the urine of pregnancy and of the menopause, A. LIPSCHÜTZ (*Endocrinology, 19 (1935), No. 1, pp. 42–50*).—The comparative luteinizing properties of the urine of pregnancy and the urine of menopause, on the basis of the coefficient of luteinization (Qlut) determined in the rat, showed that the urine of menopause was very dilute as far as its luteinizing properties were concerned.

No luteinizing effect of the menopause urine on the adult rabbit was noted

The effect of injection of residual ovarian extracts, H. W. MARLOW and F. GROETSEMA (*Endocrinology, 19 (1935), No. 4, pp. 415–420, fig. 1*).—Extracts from sows' ovaries after removal of the follicular fluid and corpora lutea caused precocious sexual development in 21-day-old mice and rats The uteri enlarged, the vaginas opened, and the smear was characteristic of the heat period, but there was no copulation with males.

Pituitary transplants from treated animals to other immature females caused the uteri to enlarge and the vaginas to open.

Theelin caused sexual maturity without the influence on the size of the uteri. Other differences from the action of theelin were also noted.

The nature of the estrogenic substance in human male urine and bull testis, R. I. DORFMAN, T. F. GALLAGHER, and F. C. KOCH (*Endocrinology, 19 (1935), No. 1, pp. 33–41, figs. 4*).—A comparison of the uterine hypertrophy and vaginal introitus responses of theelin, theelol, and oestrogenic substance from male urine and bull testis showed that theelol is more effective in causing vaginal introitus, whereas theelin produces a greater uterine hypertrophy.

The oestrogenic substance in the alkali-soluble fraction of urine is identical with theelin, but the total benzene extract resembles neither theelin nor theelol.

A substance in the alkali-insoluble fraction of the total extract enhanced the action of theelin on both the vagina and uterus.

The prolonged administration of theelin and theelol to male and female rats and its bearing on reproduction, N. J. WADE and E. A. DOISY (*Endocrinology, 19 (1935), No. 1, pp. 77–87*).—To study the influence of continued injections of theelol and theelin on reproduction 53 male and 41 female rats were given daily injections of these hormones for intervals up to 316 days. The rate of reproduction was below normal, the weight of the male genitalia was less than for controls, and lactation in the females was reduced.

Castration atrophy and theelin. Effect of theelin on atrophic uteri of castrated albino rats, B. L. ROBINSON and W. C. LANGSTON (*Endocrinology, 19 (1935), No. 4, pp. 441–446, figs. 2*).—Five daily injections of theelin restored the shrunken cornu of the uteri from 14 to 42 days after ovariectomy to practically normal. The epithelium of the lumen and glands which became almost squamous following castration was restored to the columnar type by the theelin treatment. Theelin prevented atrophy following castration for at least 40 days.

To study the persistence of the theelin effect, one horn was removed at different intervals following the withdrawal of the theelin administration.

The earliest effects of the withdrawal were noted in 12 days, but in other animals the effect was sustained longer.

Castration atrophy. A chronological study of uterine changes following bilateral ovariectomy in the albino rat, W. C. LANGSTON and B. L. ROBINSON (*Endocrinology, 19 (1935), No. 1, pp. 51–62, figs. 4*).—A study of the changes in size and histology of the uteri of rats following ovariectomy is reported. Atrophy was apparent within 14 days after ovariectomy, and the maximum atrophy occurred on about the forty-ninth day irrespective of age or body weight. The greatest amount of atrophy appeared in the endometrium, with less in the lumen and the least in the myometrium. The changes observed are described in detail.

[Studies on the physiology of lactation] (*Missouri Sta. Bul. 358 (1935), pp. 48–52*).—Continuing previous studies (E. S. R., *72*, p. 464), the influence of extracts of the oestrogenic hormone recovered from the urine of pregnant dairy cattle, theelin, and theelol on the development of the mammary gland in the mouse, rat, guinea pig, cat, and dog were investigated by C. W. Turner, E. T. Gomez, and W. R. DeMoss; the inhibiting effect of irradiation of the mammary glands of rabbits, and the galactin content of the blood of cattle, goats, and rabbits in different phases of the reproductive cycle, employing pigeons as the experimental animals, both by Turner and Gomez; and methods of extracting hormones from the pituitaries of cattle, sheep, and swine, described by Turner and McShan.

FIELD CROPS

[Farm crops investigations in Iowa], R. H. PORTER, E. O. BROWN, J. M. AIKMAN, F. G. BELL, A. L. BAKKE, J. N. MARTIN, W. E. LOOMIS, I. E. MELHUS, F. S. WILKINS, H. D. HUGHES, P. E. BROWN, F. B. SMITH, L. W. FORMAN, L. C. BURNETT, J. B. WENTZ, C. Y. CANNON, M. T. JENKINS, A. A. BRYAN, E. R. HENSON, W. G. GAESSLER, J. L. ROBINSON, R. W. JUGENHEIMER, E. V. COLLINS, E. L. ERICKSON, H. GIESE, H. C. MURPHY, J. C. ELDREDGE, C. K. SHEDD, E. W. LINDSTROM, A. T. ERWIN, and E. S. HABER (*Iowa Sta. Rpt. 1935 pp. 75, 76, 77, 79–82, 88, 89, 116–133, 134, 135, 155–157, 184, 185, 186, 187, figs. 3*).—The progress (E. S. R., 72, p. 757) is again reviewed briefly for breeding work with oats, barley, wheat, popcorn, soybeans, flax, and potatoes; variety tests with oats, wheat, barley, popcorn, flax, alfalfa, red clover (strains), sweetclover, soybeans, and sorgo; trials of legumes and grasses for hay and pasture; varietycultural experiments with oats and wheat; cultural studies with reed canary grass, sugar beets, and with alfalfa on bacterial wilt-infected soil; planting tests with alfalfa; the effect on alfalfa of spring-burning natural mulch material; cytology and physiology of winter hardiness in biennial white sweetclover; effect of cutting red and alsike clovers at different times; technic for determining water content of green forage; trials of nurse crops for small-seeded legumes; trials of legumes for green manure; factors affecting the storage quality of sweetpotatoes; permanent pasture improvement; technic in seed analysis for purity and germination; studies of the annual spread of and control methods for creeping Jennie and leafy spurge; study of seed coat structure and environmental factors affecting germination of weed seeds; eradication of biennial sweetclover by cultivation; and herbicidal and fungicidal properties of furfural and its emulsions.

The extensive corn research dealt with genetic interrelations and prepotencies of inbred lines; genetic studies; improving inbred lines by crossing followed by selfing and sibbing; comparison of inbred lines obtained from open-

pollinated varieties and from crosses between inbred lines; improvement through the use of inbred lines; ear and kernel characteristics of seed corn in relation to yield; growth response of corn hybrids and varieties on soils of different levels of fertility and on various soil types; the measurement of limiting environmental factors in the growth of the plant at different rates and spacings; correlation between composition and strength of stalk; trials of planting methods; an adaptation study of varieties, strains, and hybrid combinations in different parts of Iowa; curing and storage studies; the relation of grades of whole and shredded corn fodder and stover to methods of curing, storing, and baling; curing seed corn with artificial heat; maintenance of pure seed sources of improved varieties through field inspection and certification; and the production and distribution of seed of corn hybrids and of the parents from which they are derived. Several of the projects were in cooperation with the U. S. Department of Agriculture.

[Crop production in Kansas] (*Kans. State Bd. Agr. Bien. Rpt., 29 (1933–34), pp. 67–80, 134–174, 191–202, figs. 17*).—Articles of interest to agronomists included in these pages are entitled: Curbing the Wind, by L. C. Aicher (pp. 67–71); Manures, Legumes, and Commercial Fertilizers, by H. E. Myers (pp. 71–80); Pasture Grasses for Western Kansas, by A. E. Aldous (pp. 134–139); Wheat Improvement in Kansas, 1874–1934, With Special Reference to Quality, by J. H. Parker (pp. 139–164); The Development of Sorghum Culture in Kansas, by A. F. Swanson (pp. 165–174); A Kansas Tobacco Experiment, by P. H. Lambert (pp. 191–194); and The Field Bindweed Situation in Kansas, by J. W. Zahnley (pp. 195–202).

[Field crops experiments in Missouri], A. C. RAGSDALE, C. W. MCINTYRE, W. C. ETHERIDGE, L. J. STADLER, E. M. BROWN, B. M. KING, and H. G. SWARTWOUT (*Missouri Sta. Bul. 358 (1935), pp. 58, 59, 71–78, 85, 86*).—Progress again (E. S. R., 72, p. 466) is reported on breeding work with corn, wheat, oats for immunity or resistance to smuts, barley, and soybeans; studies of genetic and cytological effects of irradiation of corn and comparisons of mutations induced by irradiation and spontaneous mutations in corn; variety trials with corn, wheat, barley, soybeans, oats, and cotton; tests of the acid corrosive sublimate and corrosive sublimate treatments on cut and uncut seed of Irish Cobbler potatoes with plantings made immediately and 24 and 48 hr. after treatment; and comparisons of grazing systems and fertilizer tests with pasture. Achievements in field crops research described briefly include the introduction of soybeans, Fulghum oats, Korean lespedeza, and six English pasture grasses into Missouri; the breeding of Columbia oats, Missouri Early Beardless barley, and improved strains of Michigan Wonder and Fulcaster wheat; and the improvement of bluegrass pastures by adjusted grazing, an all-year pasture system, and a series of highly productive 1-yr. rotations. Several lines of work were in cooperation with the U. S. Department of Agriculture.

[Agronomic experiments in New Mexico] (*New Mexico Sta. Rpt. 1935, pp. 13–22, 25–27, 44, 45, 46, 48, 49–51, fig. 1*).—Research with field crops (E. S. R., 73, p. 170), reported on briefly from the station and from outlying fields, included variety tests with winter- and spring-sown wheat, oats, and barley, corn, grain sorghum, sorgo, cotton, potatoes, sugar beets, alfalfa, soybeans, cowpeas, and miscellaneous forage crops; breeding work with cotton and pinto beans; cultural tests with cotton and sweetpotatoes; fertilizer experiments with cotton, alfalfa, and potatoes; irrigation tests with cotton; studies of the annual production of sugar beet seed, concerned principally with application of various fertilizers and manure; breeding to combat curly top disease of sugar beets; determination of the grades and staple of New Mexico cotton; investigation

of factors affecting growth and germination of chamiza (*Atriplex canescens*), winter fat (*Eurotia lanata*), and *Valota saccharata*; a cutting test with alfalfa; adaptation of blue grama and other grasses and Ladak alfalfa for range improvement; dry farming in northeastern New Mexico, including meteorological data; and control of Johnson grass by cultural methods and burning. Certain lines of work were in cooperation with the U. S. Department of Agriculture.

[Field crops research in South Carolina], H. P. COOPER, W. B. ROGERS, R. W. WALLACE, W. R. PADEN, W. B. ALBERT, G. M. ARMSTRONG, C. C. BENNETT, C. S. PATRICK, E. D. KYZER, T. M. CLYBURN, J. H. MITCHELL, J. E. LOVE, W. H. JENKINS, E. E. HALL, J. D. MCCOWN, F. M. HARRELL, W. M. LUNN, H. A. MCGEE, N. MCKAIG, JR., W. A. CARNS, J. M. JENKINS, JR., and W. D. MOORE (*South Carolina Sta. Rpt. 1935, pp. 21–25, 33, 34, 35, 36, 37, 71–73, 75–78, 79, 84–95, 101–103, 108–110, 118–125, 129, 130, 135–141, 144, 147, 151–153, figs. 11*).—Experiments with field crops (E. S. R., 72, p. 758), reported on briefly from the station and substations (in several phases in cooperation with the U. S. Department of Agriculture), included variety tests with cotton, corn, oats, wheat, rye, potatoes, soybeans, edible soybeans, cowpeas, lespedeza, crotalaria, fiber flax (source of seed), and miscellaneous pasture grasses and legumes; selection of soybeans and their response to fertilization; breeding work and genetic studies with cotton; hybridization experiments with sea-island cotton; fertilizer and nutrition studies with cotton comprising placement, time and rate of applying potassium fertilizers, trials of nitrogen carriers, and rates of applying sodium nitrate and potassium chloride for side dressing; comparisons of nitrogen carriers on limed and unlimed soils; tests of brands of sodium nitrate; the growth response of the plant to calcium in calcium sulfate and to dolomitic limestone in a source of phosphorus test and to soluble magnesium salts and dolomitic limestone in a source of potash test; residual effects of potash on cotton; effect of magnesium and iron on growth and fruiting; effects of winter legume cover crops on cotton following, with and without sodium nitrate applications, and manure v. green manure; seed treatments, and studies in fiber length and distribution in several varieties of cotton; growth response of various crops to applications of lime and potash fertilizers; fertilizer formulas for potatoes; effects of manganese sulfate and nitrogen and potassium carriers on potato yields; tobacco investigations, including trials of fertilizer mixtures and placement, effects of natural weed fallow of several common weeds on yield and quality, study of sulfur content and effects of fertilizers high and low in sulfur, and fertilizer formulas again recommended for bright flue-cured tobacco and plant beds; cultural (including planting) tests with cotton, corn, and oats; intercropping of corn and legumes; comparison of soybeans v. corn with soybeans for silage; cutting and grazing tests with *Lespedeza sericea;* fertilizing value of cover crop tops; adaptation and propagation of pasture grasses; fertilization of carpet grass pasture and the reestablishing of lespedeza in the sod; effects of superphosphate, basic slag, and potash on the growth and mineral content of carpet grass; fertilizer, pasture, and silage tests with Napier grass; a fertilizer test with kudzu; rotation, seed production, ensiling, selection, and root system (for nodulation) studies with crotalaria; pearl millet as a summer hay crop following winter legumes in combination with oats and rye for hay and pasture; and winter legumes in combination with oats and rye for hay and pasture.

[Agronomic research in Texas], E. B. REYNOLDS, R. E. DICKSON, J. S. MOGFORD, D. T. KILLOUGH, H. P. SMITH, D. L. JONES, R. G. REEVES, R. E. KARPER, J. R. QUINBY, P. C. MANGELSDORF, G. T. MCNESS, E. MORTENSEN, V. L. CORY,

W. H. DAMERON, P. R. JOHNSON, H. F. MORRIS, J. T. VANTINE, JR., R. H. WYCHE, O. C. COPELAND, B. L. WARWICK, M. A. GRIMES, M. H. BYROM, H. M. BEACHELL, H. DUNLAVY, J. C. STEPHENS, S. E. JONES, W. H. FRIEND, and C. H. MCDOWELL (*Texas Sta. Rpt. 1934, pp. 53–58, 59, 60–63, 64–78, 125, 126, 129–131, 137–139, 143–145, 153–157, 160–167, 167–170, 178–188, 191–194, 198, 202–204, 209–216, 217, 218, 219, 220, 233, 236, 237, 243–249, 265, 266*).—Progress is reported on continued agronomic and plant breeding experiments (E. S. R., 71, p. 762) at the station and substations, including varietal tests with cotton, corn, sweet corn, wheat, oats, barley, rice, grain sorghum, sorgo, flax, peanuts, soybeans, cowpeas, velvetbeans, alfalfa, lespedeza, clover, sweetclover, vetch, crotalaria, and miscellaneous winter and summer legumes and grasses; trials with *Lespedeza sericea;* breeding work with cotton, wheat, oats, barley, corn, rice, grain sorghum, sorgo, and peanuts; development of cotton varieties adapted to mechanical harvesting; inheritance studies with cotton, corn, rice, and grain sorghums; studies of the genetic and cytological relationships of corn, *Euchlaena,* and *Tripsacum;* natural crossing in rice; technic of crossing of cotton; anatomy and microchemistry of the cottonseed; cultural (including planting) tests with cotton, corn, rice, grain sorghum, sorgo, broomcorn, Sudan grass, sweetclover, and potatoes; planting of treated and delinted cottonseed; seedbed preparation studies; comparisons of corn and grain sorghums; effects of interplanting corn and grain sorghum; effects of grain sorghum varieties and corn on succeeding crops; irrigation tests with grain sorghum and cotton; effects of continuous submergence on rice seed; border effect on field and nursery plats of rice; studies of artificial plats for field experiments; fertilizer trials with crops in rotation, corn, wheat, oats, rice, peanuts, and cotton; sources of nitrogen for cotton; effect of fertilizers on length of cotton fiber; effects of weathering in the field upon grade, color, and strength of raw cotton; fertilizer placement studies; green manures for various crops; inoculation studies with legumes; germination and longevity of the seed and control of bitterweed; control of pricklypear; weed control tests; pasture improvement and management investigations; trials of crops and seeds mixtures for summer, winter, and permanent pastures; pasture crops on rice stubble; soil-fertility and moisture-conservation studies; and crop rotations. Several phases of work were in cooperation with the U. S. Department of Agriculture.

[**Field crops experiments in Washington**], E. G. SCHAFER O. E. BARBEE, O. A. VOGEL, E. F. GAINES, V. B. HAWK, A. M. SCHLEHUBER, R. M. WEIHING, C. L. VINCENT, C. I. SEELY, H. P. SINGLETON, C. A. LARSON, and D. J. CROWLEY (*Washington Sta. Bul. 325 (1935), pp. 13–19, 48, 49, 56–62, 63, 64, 67*).—Research with field crops (E. S. R., 73, p. 32), reported on from the station and substations and in some lines in cooperation with the U. S. Department of Agriculture, comprised variety tests with spring and winter wheat, barley, oats, rye, corn, sweet corn, seed flax, alfalfa, sweetclover, red clover (strains), field peas, and sugar beets; trials of forage grasses, especially new and improved strains; breeding work with wheat, oats, barley, rye, potatoes, field peas, sweetclover, and grasses; resistance of wheat to physiologic forms of bunt; inheritance studies with corn, barley, oats, and wheat; interspecific hybrids of rye; seed production studies with crested wheatgrass; storage tests with washed potatoes; fertilizer tests with alfalfa and with potatoes, corn, and wheat in rotation; crop rotation; study of competition between alfalfa and sweetclover and cereals and grasses as companion crops; and control of bindweed and weeds in cranberry bogs with chemicals.

[**Experiments with field crops in Wyoming**] (*Wyoming Sta. Rpt. 1935, pp. 6–8, 9, 27, 28, 29, 30, 32, 33–35, 35, 36*).—Agronomic experiments (E. S. R., 72, p. 606) at the station and substations, for which progress results are reported,

included variety tests with winter and spring wheat, oats, barley, corn, potatoes, alfalfa, and miscellaneous forage grasses and mixtures; cultural (including planting) experiments with winter and spring wheat, barley, oats, corn, millet, and alfalfa; fertilizer trials with alfalfa and sugar beets; crop rotations and methods of preparing seedbeds; pasture studies; and control of Canada thistles by good stands of alfalfa. Several lines of work were in cooperation with the U. S. Department of Agriculture.

The basis of Turkish agriculture, F. CHRISTIANSEN-WENIGER (*Die Grundlagen des türkischen Ackerbaus. Leipzig: Verlag Werkgemein., 1934, pp.* [3]+*X*+*476,* [*pls. 33*], *figs.* [*43*]).—This book in successive chapters deals with the topography and climate of Turkey in relation to its agriculture; soils; different types of farming, including irrigation, dry farming, and farming under humid conditions; cultural practices; and seed. Numerous references to pertinent literature are included.

Pasture investigations.—VI, Seasonal variations in the reaction, nitrates, and ammonia of soil from differently fertilized permanent pastures, H. DORSEY and B. A. BROWN ([*Connecticut*] *Storrs Sta. Bul. 206 (1935), pp. 30, figs. 9*).—In seven differently fertilized permanent pastures (E. S. R., 70, p. 765), soil samples were taken at 2-week intervals from late March to December 1, 1931 and 1932, and in 1932 from two tilled plats.

The ammonia contents were higher in spring and autumn than in summer. There were no indications that fertilizers increased the ammonia in the soil of the permanent pasture which contained slightly more ammonia than the tilled land. Nitrates were always present, usually in very small amounts, in the pasture soils. The limed plats averaged slightly higher in nitrates than unlimed plats, but superphosphate alone did not significantly influence this factor. Plats receiving nitrogenous fertilizers were slightly higher in nitrates than those receiving only minerals. Seasonal trends were not found in the pasture soils, while the tilled plats contained appreciably more nitrates in June and July. Except in spring and fall, tilled plats averaged several times as high as the pastures in nitrates. There were some indications, although not conclusive, that the soil in closely grazed pastures had more nitrates.

The highest lime requirements usually occurred in midsummer and the lowest in the autumn, but the fluctuations were erratic and there were no distinct seasonal trends. Fluctuations in the pH values of the variously fertilized pasture soils ranged from 0.22 to 0.33 in 1931 and from 0.26 to 0.47 in 1932. In 1932 two tilled soils had maximum fluctuations of 0.48 and 0.51 pH. The periods of greatest acidity varied widely for the several pasture soils, usually occurring in the first half of the season, while in general the least acidity was found in the fall months. The tilled soils were most acid in June and July and least in November.

Management of Kansas permanent pastures, A. E. ALDOUS (*Kansas Sta. Bul. 272 (1935), pp. 44, figs. 20*).—Methods, based on experiments at the station and experience, are outlined for the improvement and management of permanent pastures in the State, and systems of grazing management that can be used effectively to maintain a high grazing capacity are suggested. The discussion treats of the pasture regions of Kansas and the economic importance of pasturage, why pastures deteriorate, weed and brush control and poisonous plants, burning pastures, grazing methods, temporary pasture crops, salting livestock, livestock watering places, run-off and erosion, use of commercial fertilizers and manure, and revegetation of depleted perennial pastures.

Pasture production and management, R. H. LUSH (*Louisiana Sta. Circ. 15 (1936), pp. 10*).—Practical information is given on the soils and preparation, liming and fertilization, seeds mixtures, and seeding for establishing permanent

pastures; the renovation, cultivation, fertilization, and rotation of old pastures; crops for temporary pastures; and the management of livestock on pasture.

Soil, field-crop, pasture, and vegetable-crop management for Delaware County, New York.—II, Pasture improvement and management, D. B. JOHNSTONE-WALLACE ([*New York*] *Cornell Sta. Bul. 639 (1935), pp. 54–77, figs. 17*).—The types of pastures in Delaware County, N. Y., and their botanical composition are described and suggestions are made for their improvement by fertilization, reseeding with specified grasses and mixtures, and grazing management.

Cutting experiments with Bahia grass grown in lysimeters, W. A. LEUKEL and R. M. BARNETTE (*Florida Sta. Bul. 286 (1935), pp. 36*).—Bahia grass plants were grown (1929–32) in lysimeters, fertilized similarly, and cut frequently, less frequently, in the seed stage, and at the end of the season. See also earlier notes (E. S. R., 72, p. 467).

The total weight of green top growth produced over 4 yr. was higher for the frequently cut grass and decreased progressively with decrease in frequency of cutting. Plants cut in mature growth stages produced the most dry matter. The true average percentage of dry matter in top growth and also dry weight of stolons and roots (when dug) were lowest for frequently cut plants and increased progressively as cutting was less often.

The true percentage and quantity of nitrogen in top growth for the 4 yr. was highest for frequently cut plants and diminished progressively with each decrease in frequency of cutting. The nitrogen content was highest for stolons from plants cut frequently and lowest for those plants cut in mature stages, and on a quantity basis, was highest in stolons of plants cut at the season's end. Roots from plants cut after or cut at the season's end had the highest nitrogen percentages. Plants cut less often or in the seed stage had similar nitrogen percentages in their roots. Nitrogen in the roots of the differently treated plants increased in quantity with less frequent removal of top growth.

The true average percentage and the quantity of phosphorus in top growth were highest for plants cut often and diminished progressively with decrease in frequency of cutting. In stolons, phosphorus was highest on a percentage basis for frequently cut plants and in general decreased in the less frequently cut plants, but the reverse order prevailed as to quantity. The phosphorus percentage in the roots was highest for plants cut frequently and for plants cut at the season's end, with that of roots of plants cut less often and cut in the seed stage intervening. Roots of plants cut at the end of the season contained the highest quantity of phosphorus.

Potassium in the top growth varied directly with the frequency of cutting in both percentage and quantity. Little variation in percentage of potassium was noted in roots and stolons, except that stolons of plants cut at the end of the season increased markedly in this element. Potassium was significantly higher in quantity in stolons of plants cut at the end of the season.

The most water leached during the cutting periods, on an average, from a tank with frequently cut grass, and decreased with less frequent cutting, while leaching during resting periods averaged less from tanks with frequently cut grass and was progressively higher with each decrease in frequency of cutting. The balance of these factors gave practically a constant percentage of percolation of the rainfall during the experiment. The amounts of nitrogen as nitrates leached was lowest for frequently cut plants and highest for plants cut least often. Little phosphorus was leached from the soil, but most came from that where the grass was cut at the season end. The average annual amounts of potassium leached varied little with frequency of cutting. The most lime was leached from the tank in which the grass was cut at

the season end; and amounts decreased progressively with increase in frequency of cutting. Silicon dioxide and combined oxides of iron and aluminum leached practically similarly from all tanks during the first 2 yr., but to a greater extent from the tank with grass cut often during the last 2 yr.

The composition of the soil in relation to total nitrogen was very similar in the different lysimeters at the beginning and end of the experiment and was not affected measurably by the growth of the differently treated grasses. The quantity of nitrogen recovered in the total plant materials, in relation to added nitrogen, was greatest for frequently cut plants and decreased progressively with decrease in frequency of cutting, while the reverse occurred in the proportion of leached nitrogen to added nitrogen.

The 1935 Iowa corn yield test, J. L. ROBINSON and M. M. RHOADES (*Iowa Sta. Bul. 348 (1936), pp. 151–198, fig. 1*).—The 849 entries in the 9 districts of the 1935 Iowa Corn Yield Test, conducted in cooperation with the U. S. Department of Agriculture and the Iowa Corn and Small Grain Growers' Association, were grouped as regular open-pollinated, experimental open-pollinated, regular hybrids, and experimental hybrids.

The regular and experimental hybrids, considered as a group, outyielded the open-pollinated classes and showed more lodging resistance. The later-maturing strains, i. e., with higher moisture content, in general had a greater percentage of damaged seed than the earlier strains. As in the past, the hybrid entries performed relatively better than the open-pollinated entries in those fields where yield was reduced by unfavorable climatic conditions, and they had the greatest advantage in yield over the open-pollinated strains in the western and central portions of the State. Differences between the highest- and lowest-yielding hybrids ranged from 21 to 36 bu. per acre in the 9 fields. In each field the highest-yielding open-pollinated variety yielded considerably more than the lowest-yielding hybrid. Duplicate entries made for 21 hybrids across a section showed excellent agreement for each hybrid, indicating that the yield of a section entry can be determined with considerable accuracy.

Seed treatment with a commercial dust resulted in a significant yield increase for the regular hybrids in both the northern and southern sections, but not in the north-central section. Treatment did not increase yield significantly of the open-pollinated varieties in any section, possibly because of highly selected seed.

Rupp Early Yellow was the highest yielder in the open-pollinated class and Iowa Hybrid 931 was the highest-yielding regular hybrid in the northern section. Schmitz Golden Krug led the open-pollinated class and Hi-Bred 315 the regular hybrids in the north-central section. In the southern section, Harkrader Yellow Dent and North Central Iowealth BZ led the regular open-pollinated and hybrid classes, respectively. In the north-central section, Hi-Bred 315, a new commercial hybrid, outyielded the average of its class by 12.3 percent and the average of the open-pollinated varieties by 22.9 percent.

The development of the cotton embryo, R. G. REEVES and J. O. BEASLEY (*Jour. Agr. Res. [U. S.], 51 (1935), No. 10, pp. 935–944, figs. 3*).—The anatomical and chemical development of the cotton embryo was studied in relation to its growth rate at the Texas Experiment Station.

The early anatomical development was found to be rather irregular, although resembling in certain respects the early embryonic development of *Malva rotundifolia*. Indications of gossypol were found much earlier in the development of the resin glands than had been reported previously. Most organs and tissues began to develop in the latter part of the formative period and in the first part of the grand period of growth. Oil, starch, pentosans, gossypol, and proteins were formed on or before the eighteenth day, and all except starch [illegible]

found throughout the remainder of the growth period. Although glucose was not clearly demonstrated in the embryo during the development period, it was found in the young lint hairs from their first appearance until just before maturity. Wide variation was found in growth rate and in size of embryos within the same boll, even though the material was deemed relatively pure and the flowers had been self-fertilized. Numerous irregularities in form were observed in mature embryos.

Korean lespedeza in rotations of crops and pastures, W. C. ETHERIDGE and C. A. HELM (*Missouri Sta. Bul. 360 (1936), pp. 22, figs. 8*).—Korean lespedeza, according to results of station studies partly in cooperation with the U. S. Department of Agriculture, furnishes an abundance of highly nutritious pasturage through the summer and early fall; is valuable for hay, with good yields and curing easily; will grow well on any farm land in Missouri, although in some places growth may be improved by lime or phosphate; if pastured, will rapidly add nitrogen and organic matter to the soil; is established at a very low cost; is a remarkably safe crop in Missouri; and is the key crop in a series of new highly productive rotations.

Practical information is given on establishing and maintaining the stand; on handling rotations of lespedeza with oats, wheat, winter barley, rye, and with corn; the relation of Korean lespedeza to soil fertility; harvesting the seed and hay crop; and on lespedeza pasture and its carrying capacity as indicated by pasturage tests.

Growing good crops of oats in Missouri, W. C. ETHERIDGE and C. A. HELM (*Missouri Sta. Bul. 359 (1936), pp. 12, figs. 4*).—Practices favoring the production of a good crop of oats, described from results of station research, include the early planting of an early productive variety, as Columbia, Fulghum, or Burt oats, drilling of seed treated for smut on suitably prepared land, and moderate use of fertilizer. The place of oats in crop rotations, particularly in an oats-lespedeza rotation, and the use of oats as a nurse crop for grass or clover are also discussed.

Relation of the degree of base saturation of a colloidal clay by calcium to the growth, nodulation, and composition of soybeans, G. M. HORNER (*Missouri Sta. Res. Bul. 232 (1936), pp. 36, figs. 15*).—A study of the relation of the total calcium supply and of the degree of saturation of a colloidal clay by calcium to the growth, nodulation, and chemical composition of (Virginia) soybeans is reported. Clay cultures prepared by titrating electrodialyzed colloidal clay with calcium hydroxide to the desired degree of calcium saturation permitted good growth. Other series of clays with a neutral reaction were prepared by replacing the remaining hydrogen ions with magnesium, barium, potassium, or methylene blue. Saturation by calcium varied from 40 to 97 percent.

The growth, nodulation, nitrogen-fixation, and calcium absorption increased with higher calcium levels at a constant calcium saturation, and likewise with an increase in the degree of saturation by calcium at a constant calcium level. The same general tendency was shown regardless of whether either hydrogen, magnesium, barium, or potassium was used as a supplementary ion. The growth and nitrogen-fixing activities of legumes were closely related to the calcium present in the plant. The amount of calcium absorbed by the soybean plants depended upon the calcium level and the degree of saturation of the clay by calcium.

Substitution of the strongly adsorbed methylene blue cation almost completely eliminated the effect of a variation in the calcium saturation, suggesting that the hydrogen ions excreted by the roots of the plant could not exchange with the methylene blue cation to any appreciable extent. Thus,

the entire displacing power of the plant's excreted hydrogen ions was directed toward the replacement of calcium ions, resulting in nearly equal absorption of calcium from the different cultures of variable degrees of calcium saturation but ample in total calcium supply. With a readily replaceable supplementary ion, the energy of replacement was divided between the two and less calcium was adsorbed.

Shriveled light weight wheat, T. E. STOA, W. E. BRENTZEL, and E. C. HIGGINS (*North Dakota Sta. Circ. 59 (1936), pp. 11, figs. 2*).—Practical suggestions for using the shriveled, light weight wheat resulting from severe injury from heat and rust for seed, based on germination, greenhouse, and seed treatment tests, include the use of the plumpest and heaviest seed available of the desired variety; fanning and grading shriveled wheat to secure the plumpest and best kernels; a germination test; dusting seed for disease control; and planting at a moderate rate and depth in a good seedbed.

Inspection of agricultural seeds, H. R. KRAYBILL ET AL. (*Indiana Sta. Circ. 213 (1935), pp. 95, fig. 1*).—The purity, percentages of germination, and weed seed content, and for legumes the hard seed content, are tabulated from tests of 1,085 official samples of seed collected from dealers in Indiana during the year ended June 30, 1935.

HORTICULTURE

Plant anatomy in agricultural research, J. H. GOURLEY and L. HAVIS (*Gartenbauwissenschaft, 9 (1935), No. 6, pp. 451–459, figs. 5*).—Pointing out that the anatomy of many plants is changed greatly by environmental conditions, such as water supply, nutrient supply, and temperature changes, the authors urge the importance of anatomical studies in conjunction with horticultural, agronomic, plant pathology, and other agricultural investigations. Certain examples are cited, such as the effect of rate of growth on the structure of the radish and the time of cutting on the structure of timothy hay.

Sand culture of seedlings: A method to control damping-off, A. A. DUNLAP (*Connecticut [New Haven] Sta. Bul. 380 (1936), pp. 133–159, figs. 10*).—Comparisons were made of sand washed with hot water and supplied with inorganic nutrients in liquid form before planting with composted soil and with composted soil autoclaved or treated with formaldehyde as media for the growing of flower, vegetable, and forest seeds. In addition seed was in one case treated with cuprous oxide powder prior to planting in untreated soil.

Seedling production was in nearly every case higher in the sand and was much superior than in untreated soil or with a cuprous oxide treatment. In addition the sand-grown seedlings were found to be more favorable in size and have better root systems for transplanting. Although a variety of sands were found suitable, colored sand proved better than pure quartz.

Calcium nitrate and sodium nitrate were found very satisfactory sources of nitrogen, provided some potassium was also supplied. Organic sources of nitrogen were not satisfactory because either the nitrogen was not readily available or the presence of organic matter encouraged fungi. In the study nitrate of soda proved superior to ammonium sulfate, but in some cases the slower growth from ammonium sulfate was beneficial in reducing length of stem. A real advantage of the sand was the fact that it could be used repeatedly if washed each time with hot water.

The use of artificial light and reduction of the daylight period for flowering plants in the greenhouse, G. H. POESCH and A. LAURIE (*Ohio Sta. Bul. 559 (1935), pp. 43, figs. 8*).—Further studies (E. S. R., 68, p. 484) again gave

evidence that the time of flowering of greenhouse plants can in many species be profoundly influenced by modifications in the length of the day. Finding that with chrysanthemums satisfactory results were secured when the day was shortened either at the beginning or end, the author suggests that dark cloth may thus be used to advantage on two beds each day. With asters, the late-flowering varieties showed a greater response to shading than did early varieties. In general the shading of asters should begin about 8 weeks after planting. Bulbous plants, with the exception of *Lilium longiflorum* and *Iris tingitana*, showed little or no response to increased day length. Among annuals to show a striking earliness in bloom when given supplemental light were snapdragons, stocks, feverfew, *Coreopsis tinctoria*, *Centaurea cyanus*, *Gypsophila elegans*, and *Salpiglossis sinuata*. Additional light during cloudy weather failed to yield results commensurate with the increased cost.

A comparison of neon, mercury vapor, and Mazda lamps showed decidedly in favor of Mazda light, the flower stems being longer in every instance and more flowers being produced in all but one variety. Low-wattage lamps (25 to 40) with intensities of from 1.5 to 44 foot-candles were equally as effective as higher wattage and more costly lights.

Comparing clear and frosted lamps, it was noted that stem length was the only character influenced, being slightly longer under clear light.

Practical considerations involved in the supplemental lighting of greenhouses are also discussed by L. C. Porter of the General Electric Research Laboratories of Cleveland.

[Horticultural studies by the Iowa Station] (*Iowa Sta. Rpt. 1935, pp. 75, 76, 87, 155, 173, 174, 176–184, 185, 186, 187, figs. 4*).—Among studies reported upon are those dealing with the inheritance of certain characters, such as fruit shape, flesh color, and time of flowering in the watermelon, by L. M. Weetman and J. N. Martin; relationship of permeability of the seed coat to germination in the black locust and *Lespedeza capitata*, by R. H. Porter and E. O. Brown; inheritance of fruit size and shape in the tomato, by E. W. Lindstrom; varieties of peony and iris, by E. C. Volz; methods of propagating apples on their own roots, methods of growing uniform stocks for apples, development of new stocks, particularly dwarfing stocks for apples, systems of soil management for apple orchards, and varieties and fertilizing of strawberries with special reference to southeastern Iowa, all by T. J. Maney and B. S. Pickett; responses of different varieties of apples to different storage temperatures, and the respiration cycle in harvested Jonathan apples as related to ripening and certain functional disorders, both by H. H. Plagge; apple breeding, plum breeding, and varieties of apples, all by H. L. Lantz, Pickett, and Maney; pear breeding, by Pickett and Lantz; improvement in peaches with special reference to hardiness, by Maney and Lantz; pruning of the grape, by Maney and Plagge; breeding of black raspberries for anthracnose resistance, by Maney; propagation of softwood and root cuttings of apple and leaf bud cuttings of black raspberry, by Pickett, V. T. Stoutemyer, and Maney; sweet corn breeding, by E. S. Haber; asparagus culture and tomato varieties, both by A. T. Erwin and Haber; cucurbit breeding, fertilizers for truck crops in southeastern Iowa, and muskmelons as a substitute crop for cabbage and melon sick soils in southeastern Iowa, all by Erwin; and factors affecting the quality and marketing of Iowa cantaloups, by Erwin and G. S. Shepherd.

[Horticultural studies by the Missouri Station] (*Missouri Sta. Bul. 358 (1935), pp. 80–83, 84, 85, 86*).—Brief information is presented on the progress of investigations in the spraying of fruit trees, use of hairy vetch as a soil improver in orchards and vegetable gardens, and apple pollination and breeding; carbohydrate storage in apple trees, comparative value of ammonium sulfate

and cyanamide for apples, relative absorption of N, P, and K by the grape, pollination of the Golden Delicious apple, and breeding apples for late blooming, all by A. E. Murneek; photoperiodism in soybeans as related to chemical composition and enzyme activity, by Murneek, A. D. Hibbard, and C. H Hills; nitrogen fertilization of grapes, and cabbage seed selection for disease resistance, both by H. G. Swartwout; embryo development in self- and cross-pollinated apples, by Murneek and E. T. Gomez; and factors determining hardiness in apple trees, by T. J. Talbert, C. G. Vinson, and Swartwout.

[Horticultural studies by the New Mexico Station] (*New Mexico Sta. Rpt. 1935, pp. 40–43, 44, 45, 46, 47, 48, 49, 51–53, fig. 1*).—Information is presented on the cropping of fruits in 1934 and 1935; fertilizer and duty of water experiments with cabbage; variety tests of tomatoes, sweet cherries, and pecans; fertilizer and irrigation studies with onions, the production of celery seed, and the production of flowering bulbs, such as hyacinth, narcissus, tulip, and Spanish iris.

[Horticultural studies by the South Carolina Station] (*South Carolina Sta. Rpt 1935, pp. 28–33, 78, 113–118, 143, 144, 145, 146, 147, 148, figs. 3*).—In the usual manner (E. S. R., 72, p. 769) there is discussed briefly the progress of various investigations, as follows: Apple pollination and sterility, by A. M. Musser and F. S. Andrews; factors influencing the fruiting of the Fordhook lima bean and snap bean and sweet corn variety tests, both by Andrews; breeding of spineless okra; and tung-oil tree adaptation trials.

Among Sandhill Substation projects discussed are fertilizer trials with peaches, by Musser and L. E. Scott; variety trials with peaches and grapes, by Scott; and the use of rubber bands for tying asparagus bunches

Among Truck Substation projects reported upon are variety and strain tests with vegetables and fertilizer experiments with snap beans, cabbage, and tomatoes, both by J. M. Jenkins, Jr.

[Horticultural investigations by the Texas Station], S. H. YARNELL, J. F. ROSBOROUGH, H. F. MORRIS, P. R. JOHNSON, W. H. FRIEND, E. MORTENSEN, R. H STANSEL, R. A. HALL, J. F. WOOD, H. M. REED, J. J. BAYLES, L. E. BROOKS, L. R HAWTHORN, R. H. WYCHE, D. L. JONES, F. GAINES, and W. H. DAMERON (*Texas Sta. Rpt. 1934, pp. 19–28, 139, 140, 146, 147, 157, 158, 167, 194, 195, 196–198, 205–207, 208, 209, 216, 217, 228–233, 234–236, 249–253, 254–265*).—Included are brief reports of studies upon the adaptability of fruit crops, berry breeding, culture of the blackberry, varieties of citrus, rootstocks for citrus, pruning and processing of figs, varieties and breeding of grapes, rootstocks for grapes and pecans, varieties, breeding, and culture of strawberries, chromosome behavior in blackberries and raspberries, varieties of vegetables, fertilizers for asparagus, culture and fertilization of onions, culture and varieties of spinach, varieties and breeding of tomatoes, culture of the tomato, nature and control of puffing in the tomato, varieties of ornamentals, and varieties of iris.

In addition there are supplemental notes on the results of variety and cultural trials with vegetables, fruits, dates, ornamentals, tung-oil trees, and slash pine at Beeville, Tyler, Angleton, Beaumont, Lubbock, Balmorhea, Nacogdoches, Sonora, Weslaco, Iowa Park, and Winter Haven.

[Horticultural studies by the Washington Station] (*Washington Sta. Bul. 325 (1935), pp. 12, 25, 26, 44–48, 49, 62, 63, 67*).—Included are brief reports upon progress of investigations dealing with the chemical characteristics of maturing apples, by J. L. St. John; the removal of lead and arsenic residues from fruit, by K. Groves and St. John; use of vitrified enamelware for processing apples, by H. L. Garver; cover crops for orchards, by O. M. Morris and F. L. Overley; peach harvesting, packing, and storage, by Morris; winter injury to fruit trees, by F. L. Overholser and Overley; orchard fertilization, by Overholser, Overley,

and W. J. Clore; effect of oil sprays on apple trees, removal of spray residues from apples and pears, and pollination of the Delicious apple, all by Overholser and Overley; irrigation of orchards, by Clore; propagation of apple stocks, by Morris; breeding of raspberries and strawberries, by C. D. Schwartze; breeding of tomatoes, by C. L. Vincent; soil moisture relationships in irrigated orchards, by C. A. Larson; tree and fruit responses in apples, by Clore; and blueberry breeding, by D. J. Crowley.

[Variety and propagation tests by the Wyoming Station] (*Wyoming Sta. Rpt. 1935, pp. 31, 32, 33*).—Brief notes are presented on the results of variety tests with apples, crabs, sour cherries, and plums at Lander, and vegetable variety tests at Lyman.

Soil, field-crop, pasture, and vegetable-crop management for Delaware County, New York.—III, Vegetable crops, F. O. UNDERWOOD ([*New York*] *Cornell Sta. Bul. 639 (1935), pp. 78–85, fig. 1*).—Based on a survey of one hundred-odd farms, a discussion is presented of the soil and cultural and fertilizer requirements of cauliflower, the principal horticultural crop grown in Delaware County. Additional notes are presented on brussels sprouts, cabbage, and market peas.

Storage of vegetable seeds, L. V. BARTON (*Contrib. Boyce Thompson Inst., 7 (1935), No. 3, pp. 323–332*).—Of several species of vegetable seeds stored open and sealed at room temperature and at −5° C. and in some cases dried with calcium oxide, eggplant and tomato kept well under all conditions. Carrot, lettuce, onion, and pepper seeds were injured by sealed storage at room temperature unless the seeds were dried. With drying sealed storage was superior to open storage at room temperature. Lettuce seed gained in its capacity for seedling production with increased length of the storage period up to the maximum of 3 yr. Germination of lettuce on the other hand remained practically constant throughout the period. The author concludes that under conditions existing at Yonkers open storage at room temperature will maintain vitality for 2 yr. in the majority of cases. With reduced moisture content and sealing vitality was assured for at least 3 yr.

Osram and neon lights in vegetable forcing [trans. title], J. REINHOLD (*Gartenbauwissenschaft, 9 (1935), No. 6, pp. 558–574, figs. 12*).—In most cases additional light supplied by either type of lamp produced larger crops and induced earlier fruiting. In most instances neon light proved superior to osram light, but the tomato was somewhat sensitive to neon and did better with the osram light. Of three crops, cucumbers, tomatoes, and kohlrabi, only the cucumber returned sufficient profit from supplemental light to justify its use.

Changes in the chemical composition of green snap beans after harvest, M. W. PARKER and N. W. STUART (*Maryland Sta. Bul. 383 (1935), pp. 291–313*).—In studies with Giant Stringless Green Pod beans harvested in the early morning it was observed that the principal after-harvest changes were those involving carbohydrates, particularly the hydrolysis of starch and an accumulation of total sugars. Low temperatures accelerated the accumulation of total sugars. During storage snap beans lost crispness, due in part to a loss of water and in part to an increase in soluble pectin, but just how important the pectic changes were in relation to crispness could not be established. It is believed, however, that the marked increase in the ratio of pectin to protopectin during cold storage must influence crispness.

Considering separately the pods and the immature beans therein, the authors noted that whereas starch decreased and sugars increased in the pods the reverse was true in the seeds. There was little, if any, translocation of soluble sugars from the pods to the seeds during storage. Hemicellulose was

more abundant in the pods and after harvest increased in the seeds and decreased in the pods. The pectin occurred principally in the pods.

A very high respiration rate was observed in green snap beans. Computed on a basis of actual weight, the loss from respiration in a bushel (30 lb.) of fresh snap beans was 1.77 oz. in 48 hr. Synthesis of protein occurred more rapidly in large snap beans stored at a warm temperature than in those stored at low temperatures. Proteolysis also occurred in small snap beans stored at warm temperature, and, since seeds were small or entirely absent, the authors suggest that proteolysis must have occurred in the pods. It is suggested that the nitrogen metabolism of small snap beans is essentially the metabolism of the pods. In large beans nitrogen metabolism was directed by the seeds.

The quality yardstick, Z. I. KERTESZ (*Canner, 82 (1936), No. 12, pp. 7, 8, fig. 1*).—Studies at the New York State Experiment Station of factors concerned in the determination of quality in canned peas showed that usually flavor and toughness of peas are closely associated characteristics. Of several methods of determining maturity in canned peas that in which the proportion of solids insoluble in alcohol was established gave a good indication of maturity, since this fraction includes proteins, starches, and other compounds the proportion of which increases as peas mature.

Pollination and life-history studies of the tomato (Lycopersicon esculentum Mill.), O. SMITH ([*New York*] *Cornell Sta. Mem. 184 (1935), pp. 16, pls. 23*).—Using as source of material Bonny Best tomato plants growing in the greenhouses of Cornell University and the Oklahoma Agricultural and Mechanical College, the results are presented in detail of microscopic observations on flower bud formation, pollen, and ovule development, and the growth of the fertilized zygote. In the tomato flower the first primordial whorl to develop was that of the calyx, followed in order by the corolla, stamens, and carpels. The development of the microspore preceded that of the macrospore. The pollen grains were 2-nucleate at the 4-celled embryo sac stage, containing both a spherical generative and a spherical vegetative nucleus. The final division of the generative nucleus occurred during the growth of the pollen tube. The embryo did not begin to divide until from 36 to 48 hr. after fertilization, and maturity was reached 49 and 53 days after pollination. The structure of the mature fruit is discussed.

Temperature at the time of bloom was found to exert a profound influence on the development of the flower, its pollination, and fertilization. The tomato flower is said to be usually self-pollinated, but extremely high temperatures caused the styles to elongate abnormally and exceptionally early, with the destruction of the stigmatic surface taking place before pollination could occur. Pollen germination and growth was extremely poor on tomato stigmas at 100° F., with the optimum at 85° and good results at 70°. Fertilization was first recorded 50 hr. after pollination.

Nystate, a new hybrid tomato, shows much promise, C. B. SAYRE (*Farm Res. [New York State Sta.], 2 (1936), No. 2, p. 9, fig. 1*).—This new variety, said to be adapted to both market gardens and commercial cannery uses, produced the highest yield among 30 varieties tested in 1935. The fruits are described as large, symmetrical, and deep red in color without any green around the stem end.

Effect of drouth on the nutrient levels in the tomato plant, E. M. EMMERT (*Soil Sci., 41 (1936), No. 1, pp. 67–70, fig. 1*).—At the Kentucky Experiment Station tomato plants growing in greenhouse benches filled with red clay or black silt loam and provided with just enough water to keep the plants from wilting during normal weather showed a definite increment in nitrate nitrogen, a decrease in the concentration of phosphate, and a consistent increase in con-

centration of potash as compared with plants grown under similar conditions but watered freely. The plants on the dry plats of both soils were greatly stunted and produced but little fruit, and this was largely affected by blossom end rot.

Tomatoes, J. E. BAILEY (*Georgia Sta. Circ. 106 (1936), pp. 6, fig. 1*).—General information is presented on varieties, growing of plants, planting in the field, fertilizers, culture, training, and the control of insects and diseases. Of six varieties, the Gulf State Market was outstandingly the most productive. In fertilizer trials materials high in superphosphate gave the best results, and the use of a 6–10–6 or 4–12–4 (NPK) mixture at the rate of from 600 to 1,000 lb. per acre is recommended. Although untrained plants generally gave the larger yields, the author states that pruning and staking gave larger fruits, and this method of culture is suggested as desirable in the home garden and for intensive truck culture.

Tree fruits for Iowa, H. L. LANTZ (*Iowa Sta. Bul. 341 (1935), pp. 65–112, figs. 9*).—This bulletin is designed to assist Iowa orchardists in the selection of satisfactory tree fruit varieties for the home or commercial orchard.

New Minnesota fruits named, W. H. ALDERMAN (*Minn. Hort., 64 (1936), No. 2, pp. 23, 24, figs. 2*).—This article discusses the origin, development, and characteristics of two recently named Minnesota Experiment Station seedling fruits, namely, the Beacon apple and the Ember plum.

Random notes on fruit tree rootstocks and plant propagation, II, H. B. TUKEY and K. D. BRASE (*New York State Sta. Bul. 657 (1935), pp. 26, figs. 9*).—This, the second contribution to the general subject (E. S. R., 72, p. 773), states that tops of pear trees growing on quince roots were injured no more at —24° F. than were adjacent pears on pear roots, yet the quince roots were killed. Heel cuttings of quince gave higher percentages of rooting than straight cuttings, and wood collected in the fall rooted more freely than that collected in the spring. East Malling clonal rootstocks withstood successfully two drought summers and a winter temperature of —25°. Rapid propagation of apples was secured by top working 2-year-old nursery stock by whip grafts and planting the trees in the orchard the same year. Greater injury to mazzard seedlings in the nursery than to orchard trees on mazzard roots was traced to leaf spot defoliation of the young trees. Mahaleb seedlings were injured little or none. In some cases Montmorency cherries were killed back by cold to the line of the union, whereas the presumably more tender roots were not injured. Rose plants packed in granulated peat moss with a pH of 3.2 died subsequently, whereas the correction of the acidity to pH 5.7 to 6 resulted in normal growth. Fall application of fertilizers to cherry and apple trees prior to digging and the application of fertilizers to roots of dormant trees in storage failed to increase growth and vigor after planting in the orchard.

Root development in certain deciduous fruits and the walnut [trans. title], B. FRISCHENSCHLAGER (*Gartenbauwissenschaft, 9 (1935), No. 4, pp. 269–292, figs. 3*).—Stating that the root systems of the various species were characterized by the types of framework and the manner of branching of the very small rootlets, the author discusses the peculiarities of each species. The apple, for example, has a shallow, spreading root system, the pear, cherry, and walnut deep-growing root systems, and the plum varied considerably according to the subspecies.

The morphology of the apple flower.—I, The number of ovules in the flowers in their relation to the genotype and the position of the flowers in the flower cluster [trans. title], G. KRUMBHOLZ (*Gartenbauwissenschaft, 9 (1935), No. 6, pp. 509–557, figs. 3*).—In many apple varieties the central flower of each cluster is distinguished from the lateral flowers by a greater number of

ovules. Varieties are classified into three groups, (1) those with 10 ovules in the central and lateral blooms, (2) those with 10 to 20 ovules in the central and about 10 in the lateral blooms, and (3) those with approximately 20 ovules in both the central and side blooms. In certain varieties the middle flower had a normal 5-celled ovary and the side flowers often only 4 or even 3 cells. These differences permitted the classification of apples into five groups. On the other hand pears had uniformly 5-celled ovaries with 2 ovules in each cell.

Fertilizing apple trees for profit, F. W. HOFMANN (*Va. Fruit, 24 (1936), No. 2, pp. 16–27*).—Evidence is presented by the Virginia Experiment Station to show that whereas nitrogen is highly effective in increasing the growth of apple trees in their early years, later a complete mixture gave more favorable results. As the gains in the nitrogen alone plats began to recede, the completely fertilized plats started to outyield other treatments. Keeping tests of apples from the different plats indicated that the inclusion of potash in the fertilizer favored long keeping. The applications of small quantities of complete fertilizer gave very profitable increases in yield.

Hardiness in relation to fertilizer applications, F. S. BROWNE (*Pomol. and Fruit Growing Soc. Quebec, Ann. Rpt., 41 (1934), pp. 22–24*).—Observations on the comparative winter injury to Wealthy apple trees included in a series of fertilizer treatments at Abbotsford, P. Q., indicated that where a complete material containing N, P, and K was applied injury was much less than on the other plats. All the trees on this plat produced a worth while crop the year following the severe injury. Results with Golden Russet were similar except that the variety being less hardy than Wealthy suffered more generally.

Residue removal studies, the experimental spray programs, F. L. OVERLEY, R. E. MARSHALL, K. GROVES, and J. L. ST. JOHN (*Wash. State Hort. Assoc. Proc., 31 (1935), pp. 160–162*).—Hydrochloric acid and sodium silicate with a vegetable oil soap plus an unemulsified mineral oil of 45–50 viscosity was found by the Washington Experiment Station to be the most effective washing solution for apples sprayed with any of the new schedules. A tandem washing machine using both hydrochloric acid and sodium silicate was most effective in removing residues from fruits heavily sprayed with different combinations of lead arsenate, soap, fish oil, and mineral oil. Fruits sprayed with straight lead arsenate with or without materials containing calcium and harvested before the accumulation of much wax were effectively washed with hydrochloric acid, especially if some mineral oil was added. Sodium silicate when used alone at the rate of 60 to 85 lb. per 100 gal. and at 110° F. was not satisfactory when the fruit had been sprayed with any of the calcium, zinc arsenite, or zinc arsenate sprays. For fluorine-oil-sprayed fruits an overhead flood, underbrush washing machine supplied with hydrochloric acid was found to be the most effective single washing treatment.

Early results of peach breeding in New Jersey, M. A. BLAKE and C. H. CONNORS (*New Jersey Stas. Bul. 599 (1936), pp. 32, figs. 11*).—In essence a review of peach breeding activities at the station, this paper summarizes genetic findings and devotes considerable space to describing and discussing the seedlings that have been named and disseminated.

Pollination experiments with apricots, peaches, and almonds [trans. title], C. F. RUDLOFF and H. SCHANDERL (*Gartenbauwissenschaft, 9 (1935), No. 6, pp. 500–508*).—Chiefly in tabular form, there are presented the results of self- and cross-pollination experiments with varieties of apricots, peaches, and almonds, supplemented with information on the germination of the pollen with and without the presence of pistil tissue. Of 31 apricots, 46 peaches, and 4

almonds, 19, 33, and 0, respectively, proved adequately self-fertile. The remaining peaches and apricots are said to be under further study to determine their definite status.

Name new red raspberry after O. M. Taylor, G. L. SLATE (*Farm Res. [New York State Sta.], 2 (1936), No. 2, pp. 1, 11, fig. 1*).—A brief account is presented of the characteristics and potential value of Taylor, a recently named red raspberry derived from a cross of Newman with Lloyd George. The fruit is said to be very large, long conic in shape, the flesh firm, and the quality very good, nearly equal to that of Cuthbert.

The etiolation shoot method of fruit propagation, J. LAMBOURNE (*Malayan Agr. Jour., 23 (1935), No. 11, pp. 514–527*).—The etiolation method, in which branches laid down horizontally and covered with soil send up perpendicular shoots which often root at the base, was found successful in propagating the lime, lemon, mandarin orange, guava, and certain species of Eugenia. With other plants, such as chiku, rambutan, pulasan, and mango, the method was too slow, and better results were secured with marcottage in the case of the chiku and with budding in the case of the rambutan, orange, and pomelo. Shading and watering or mulching of the beds during dry periods proved beneficial.

Studies on the bearing behavior of the Fuerte avocado variety, R. W. HODGSON and S. H. CAMERON (*Calif. Avocado Assoc. Yearbook, 1935, pp. 156–165, figs. 5*).—Correlating the annual production of Fuerte trees with temperature records, there was observed a distinct tendency for an alternation of high and low yields, with a high mean temperature during the period of blooming favoring large production. There was a definite indication that alternate high and low production may be reversed by two successive bloom periods of above or below average temperature. Large crops occurred as the combined result of a small crop the preceding year and high mean temperatures during bloom. Girdling for the purpose of regulating or controlling the bearing habit gave inconclusive or negative results. There was a definite indication that an excessive crop delays the time of bloom, reduces its quantity, and decreases yields the succeeding season. Early harvesting is suggested as a possible means of regulating production.

Four new citrus varieties—the Kara, Kinnow, and Wilking mandarins and the Trovita orange, H. B. FROST (*California Sta. Bul. 597 (1935), pp. 14, figs. 5*).—Descriptions are presented of four new forms of citrus originated as seedlings in the breeding work of the Citrus Experiment Station at Riverside, and which are now being designated for extensive trial.

On bud union effect in citrus, R. W. HODGSON and S. H. CAMERON (*Calif. Citrogr., 20 (1935), No. 12, p. 370, figs. 2*).—In propagation studies at the University of California at Los Angeles trees of five rootstocks, namely, sour, sweet, and trifoliate oranges, grapefruit, and rough lemon came into bearing one or two seasons earlier when budded to themselves than when unbudded. The mere presence of a bud union thus caused the citrus trees to fruit earlier than naturally. Size differences are not believed important since the two lots appeared almost identical in this respect during their early years. Comparing sweet orange budded with standard varieties with sweet orange seedlings, in every case the seedlings were larger, more upright, and decidedly later in coming into bearing.

Mt. Albert citrus test area (*Jour. New Zeal. Inst. Hort., 5 (1936), No. 3, p. 56*).—Rootstock experiments begun in 1933 have shown that rough lemon produces large and open framework trees more rapidly than do sweet, sour, or trifoliate orange stocks. Sweet orange produced a sturdy tree of compact growth, sour orange produced growth which was very short jointed with small

foliage of deeper green hue, and trifoliate orange produced trees of very poor growth and very precocious as to flowers and fruit.

The Robertson strain of the Washington Navel orange, A. D. SHAMEL and C. S. POMEROY (*Jour. Heredity, 26 (1935), No. 5, pp. 218–222, figs. 2; also in Calif. Citrogr., 20 (1935), No. 12, pp. 372, 396, 397, figs. 2*).—Discussing the history of a superior limb sport of Washington Navel orange found in 1925 near Redlands, Calif., the author reports that the fruit of this so-called Robertson strain is much larger than normal Washington Navel oranges and the trees have a distinct tendency to bear large clusters. The Robertson fruits ripened almost 3 weeks earlier, but in amount and flavor of juice were similar to Washington Navel. The trees made a relatively short, pendant vegetative growth, giving them a somewhat drooping appearance.

Refrigeration of oranges in transit from California, C. W. MANN and W. C. COOPER (*U. S. Dept. Agr., Tech. Bul. 505 (1936), pp. 88, figs. 36*).—Based on the results of 29 refrigeration tests made during the period 1928–33 with cars iced according to different plans, the authors report that during the summer months preicing of the cars before loading followed by reicing at the first icing station and once again in transit afforded nonprecooled fruit better temperatures than did standard refrigeration, which consisted of icing after loading and at every regular icing station enroute. Preiced cars not replenished at the first icing station but iced once in transit gave refrigeration equal to standard refrigeration in the fall but not in summer. Preiced cars replenished by the shipper at the packing house and reiced once in transit gave better refrigeration than standard refrigeration during summer, provided the cars were held at the packing house from 12 to 24 hr. after loading before replenishing the bunkers. Preiced cars replenished after loading and not reiced in transit gave nonprecooled fruit temperatures equal to standard refrigeration during early spring and late fall. Precooling fruit in the car with fans for 16 hr. increased materially the rate of cooling, especially in the top layer, and decreased temperature differences throughout the load. The lowest and most uniform temperature in the tests occurred in carloads of warehouse-precooled fruit preiced only. No significant relation was recorded between method of refrigeration and spoilage, very little loss occurring in any of the shipments. Loss in weight of fruit in transit was slight and was determined largely by the temperature of the fruit.

Technical information is presented on the sources of heat to fruit in transit, effect of outside temperatures, effect of fruit temperature at loading on the refrigeration of oranges in transit, and the effect of the manner of loading on the temperature of the fruit in the car.

The granting of lower rates on the various modified types of refrigeration is said to have led to the adoption of the modified methods in place of the more costly standard refrigeration.

Soil reaction and azalea growth, R. M. BARNETTE and H. MOWRY (*Soil Sci., 41 (1936), No. 1, pp. 71–79, pl. 1, fig. 1*).—As observed by the Florida Experiment Station, Formosa azalea plants growing under carefully adjusted soil acidity conditions made a slow but healthy growth below pH 5 and a vigorous, healthy, elongated development between pH 5 and 7, while above 7 the growth was slow and the foliage chlorotic. The chlorotic leaves were usually small and had green veins with yellow tissue between the veins. Determinations of the pH upon 168 samples of soil obtained from different places in Florida, Georgia, South Carolina, and Alabama showed an extreme range in pH of 3.54 to 7.48, with 67.8 percent of the soils lower than pH 6.

Dahlias: Their history, classification, culture, insects, and diseases (*Michigan Sta. Spec. Bul. 266 (1935), pp. 83, figs. 46*).—This is a presentation

of useful information on the growing of this autumn flower. It includes sections on Dahlia Culture, History, and Classification, by C. E. Wildon; Insects Infesting Dahlias, by E. I. McDaniel; and Dahlia Diseases, by R. Nelson.

Germination of delphinium seeds, L. V. BARTON (*Contrib. Boyce Thompson Inst., 7 (1935), No. 4, pp. 405–409*).—Seeds of annual larkspur which do not germinate at all well at high temperatures were induced to grow at prohibitive temperatures by pretreatment for a short period in a moist condition at low temperature. The author suggests that larkspur seeds may be treated on a moist surface for 1, 2, or 3 weeks at temperatures of 10° or 15° C. or held in a refrigerator. Good germination can then be secured at constant temperatures up to 30°. Although perennial larkspur was not nearly so sensitive to high temperatures as the annual form, low temperature pretreatment also gave favorable results when the seed was to be grown at 35°.

Gladiolus culture with special reference to winter forcing, B. E. GILBERT and F. R. PEMBER (*Rhode Island Sta. Bul. 255 (1935), pp. 18*).—Over a period of years several varieties of gladiolus were grown on field plats and in greenhouse plats treated differentially with respect to lime and nitrogen. Soil acidity did not appear to be a factor, and it is concluded that gladiolus will grow as well on soils in a medium acid condition as on those near neutrality. The gladiolus had no apparent preference for either nitrate of soda or sulfate of ammonia, nor was any consistent response to nitrogen noted in the number of flower spikes. The weight of new corms was greater where nitrogen was applied.

Corms produced in the greenhouse did not yield as many flower spikes as those produced in the field but were sufficiently valuable to be considered worthy of planting in the field. Attempts to stimulate corms into growth in winter by exposure to ethylene chlorohydrin and by drying and by preheating gave negative and in some cases deleterious results. Extensive experiments with supplementary light showed this to be an effective means of increasing the yield of flowers if supplied during the early growth stages. A 100-w Mazda lamp was sufficient to bring about results, and in some cases a 50-w lamp gave decided increases. Shading during April and May inhibited flowering, indicating a photoperiodic effect. The size of the corm, its maturity, storage conditions, and the time of planting were all factors of importance in securing good yields.

Storage temperatures and chemical treatments for shortening the rest period of small corms and cormels of gladiolus, F. E. DENNY and L. P. MILLER (*Contrib. Boyce Thompson Inst., 7 (1935), No. 3, pp. 257–265*).—Observations on the rate of germination in soil at room temperature of small corms (1 to 6 g in weight) of Souvenir, Alice Tiplady, and Remembrance, after storage at temperatures ranging from 3° to 35° C. for periods of from 28 to 97 days, showed that low temperature was effective in stimulating growth. High temperature storage (35°) gave germinations earlier than room temperature only in the later stages of the rest period. Ethylene chlorohydrin was of only slight stimulating effect to corms stored at low temperature, but gave large gains in germination in corms previously stored at room temperatures or higher.

Development of the floral axis and new bud in imported Easter lilies, N. E. PFEIFFER (*Contrib. Boyce Thompson Inst., 7 (1935), No. 3, pp. 311–321, figs. 2*).—The relation to the life history of the origin and development of the floral axis is given for two varieties of lilies commonly forced in the United States at the Easter season.

Lawns: Planting and maintenance in Colorado, G. BEACH (*Colorado Sta Bul. 420 (1936), pp. 12, figs. 4*).—General information is presented on preparation and planting; varieties of lawngrass; control of weeds, diseases, and insects; the use of fertilizer; and the renovation of old lawns.

Liming lawn soils, H. B. SPRAGUE (*New Jersey Stas. Circ. 362 (1936), pp. 4, fig. 1*).—Information of a general nature is presented on the function of lime in correcting soil acidity and promoting growth, on kinds of lime to use, and on the time and rates of application.

FORESTRY

[Forestry studies by the Iowa Station], G. B. MACDONALD (*Iowa Sta. Rpt. 1935, pp. 174, 175*).—Herein is reviewed briefly the progress of studies upon tree species for planting under different soil, moisture, and climatic conditions, and the establishment and maintenance of a nursery for propagation of trees, shrubs, grasses, and other plants of possible erosion control value.

Ohio Forest News, [February 1936] (*Ohio Forest News [Ohio Sta.], No. 27 (1936), pp. 8, figs. 2*).—Items of information are presented on miscellaneous subjects, such as public use policies in the State forests, control of white pine blister rust, meaning of forestry to the Ohio Valley, stream bank planting, marketing of forest products, and extension activities.

[Forestry investigations by the South Carolina Station] (*South Carolina Sta. Rpt. 1935, pp. 78, 79*).—Brief comments are presented on the results of studies of different methods of establishing slash pine on the poorly drained soils of the coastal region, and of natural reforestation in the absence of fire and grazing.

Technical notes No. 1–100, Lake States Forest Experiment Station (*U. S. Dept. Agr., Forest Serv., 1935, pp. [9]+100, figs. 2*).—This is a compilation of brief papers published in mimeographed form and designed to present practical information to foresters on various silvicultural subjects, such as fire control, forest measurement, forest management, forestation, and forest surveying.

Shipmast locust, a valuable undescribed variety of Robinia pseudoacacia, O. RABER (*U. S. Dept. Agr. Circ. 379 (1936), pp. 8, pls. 6*).—A descriptive account is presented of a form of locust distinguished from the common type by an unusually straight trunk, thicker bark, more durable wood, and fewer flowers. Very rarely, if ever, are seeds and pods produced, and as a result propagation is mostly by sprouts or root cuttings. The botanical name *R. pseudoacacia rectissima* is suggested.

Root development of pitch pine, with some comparative observations on shortleaf pine, W. E. MCQUILKIN (*Jour. Agr. Res. [U. S.], 51 (1935), No. 11, pp. 983–1016, figs. 17*).—Based on detailed studies in the Lebanon State Forest in New Jersey, in woodlands near Medford, N. J., and in the Mont Alto State Forest in Pennsylvania, the author presents a descriptive account of root development in pitch pine trees of various ages and to some extent also in the shortleaf pine.

The root system of the pitch pine is classed as the generalized type, attaining a moderately extensive development both vertically and horizontally. The taproot is the most conspicuous feature of the seedling root system, sometimes penetrating to a depth of 1 ft. or more in the first year. The basic plan of root growth in the pitch pine consists of a taproot from which 15 to 30 horizontal branches originate and extend radially in the surface layers of soil. In the pine barrens the taproot is usually the longest and most conspicuous root up to the eighth or tenth year, but soon after this the strongest laterals outstrip the taproot and eventually most of them exceed the taproot in length. Vertical roots designated as sinkers are sent downward from the laterals and assume some of the functions of the taproot.

Root branches irrespective of size were traced to the primary xylem of the parent root, thus suggesting that a root system poorly branched in the beginning will always be poorly branched. Adventitious roots appeared to be absent in pitch pine except in rare cases where they developed in wound tissues caused by the severance of roots. Pitch pine was found capable of extensive root growth below the water table in saturated soils. On heavier soils root development tended to be less extensive than in the sandy soils of the Coastal Plain. Mycorrhiza were a conspicuous feature of pitch pine roots, being found at all depths of both drained and saturated soils but attaining their greatest profusion in the surface organic layers.

The root development of shortleaf pine (*Pinus echinata*) was found fundamentally similar to that of the pitch pine, with the most marked difference being a tendency of the shortleaf to develop a much stronger and more massive taproot. The shortleaf pine was not found on saturated soils.

Influence of weather factors on moisture content of light fuels in forests of the northern Rocky Mountains, G. M. JEMISON (*Jour. Agr. Res. [U. S.], 51 (1935), No. 10, pp. 885–906, figs. 12*).—Measurements of 16 weather factors recorded on a clear-cut, half-cut, and a full-timbered area over the 10-yr. period 1924–33 were correlated with fuel moisture content. Relative humidity and air temperature are shown to explain 97 percent as much of the variation in duff moisture as was explained by the 8 most important variables together. The joint correlation that exists between duff moisture (*DM*) and relative humidity (*RH*) and air temperature (*T*) was facilitated by use of an "absolute-humidity index." With this index, represented by $\frac{RH}{T}$, the standard linear regression equation may be used in the following form to express the relation between these three variables: $DM=a+b\left(\frac{RH}{T}\right)$. High standard errors associated with single estimates based on this equation prevent the substitution of simple humidity and temperature measurements for the more difficult duff-moisture measurements. One advantage foreseen in a method of estimating fire danger through use of the variable $\frac{RH}{T}$ was that it would make possible fire-danger ratings for the past seasons during which records were made of air temperature and relative humidity but not of duff moisture.

The effect of direction of illumination upon the visibility of a smoke column, C. C. BUCK and W. L. FONS (*Jour. Agr. Res. [U. S.], 51 (1935), No. 10, pp. 907–918, figs. 8*).—Measurements made in a laboratory of an artificial smoke column to determine the effect of the direction of illumination upon its visibility showed that visibility is at a minimum when the angle between the incident light and the line of sight of the observer is 45°, increasing very rapidly above 90° to a maximum near 180°. The significance of the findings to forest fire protection is discussed.

DISEASES OF PLANTS

Diseases of plants in the United States in 1934, compiled by H. A. EDSON, P. R. MILLER, and J. I. WOOD (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1935, Sup. 90, pp. 135, figs. 20*).—Following the list of collaborators and the temperature and precipitation maps, the summaries of diseases for 1934 are arranged under those of cereal crops, forage and cover crops, fruits and nuts, vegetable crops, special crops (tobacco, cotton, hops, and peanuts), sugar crops, trees, and ornamentals. The scientific names of parasites and the names of the virus and nonparasitic diseases are included in the index.

The Plant Disease Reporter, February 1, February 15, and March 1, 1936 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 20 (1936), Nos. 2, pp. 24–36, figs. 4; 3, pp. 37–61, figs. 3; 4, pp. 62–81, figs. 12*).—Notes are given on the following items of current interest:

No. 2.—Relative prevalence of various corn ear rot fungi in the 1934 crop, by P. E. Hoppe and J. R. Holbert; *Sphaeropsis malorum* on *Abies concolor*, by M. E. Fowler; *Fusarium* spp. on gladiolus, by L. McCulloch; chlorosis of poinsettia in Washington State, by F. P. McWhorter; and phony peach disease control and citrus canker eradication, both by L. A. Strong and previously referred to (E. S. R., 74, p. 785).

No. 3.—A list of plants attacked by the sugar beet nematode (*Heterodera schachtii*) (with 143 host plants definitely established and 3 members of the grass family listed as probable hosts), by M. N. Corder, E. M. Buhrer, and G. Thorne; diseases of hops on the Pacific coast in 1934 and 1935, by G. R. Hoerner; observations on weather conditions and their relation to plant diseases in Tennessee and fruit and vegetable losses in market and kitchen caused by plant diseases, both by P. R. Miller; notes on *Venturia rhododendri* on *Azalea* and *Botrytis* on *Exacum affine*, by T. B. Post; and literature notes on *Fusarium* infection of gladiolus, by L. McCulloch.

No. 4.—Incidence of ear rots in the 1934 corn crop, by N. E. Stevens; occurrence of curly top in the Pacific Northwest in 1935, by B. F. Dana; secondary scab infection of apples in storage, by A. B. Groves et al.; pecan diseases in northern Louisiana in 1935, by H. E. Parson; pecan diseases in other States in 1935, by J. R. Cole; and notes on new or unusual outbreaks of diseases of ornamentals in New Jersey in 1935, by R. P. White.

[Phytopathological studies by the Iowa Station] (*Iowa Sta. Rpt. 1935, pp. 67–74, 77–79, 82, 83, 83–87, 88, 159–161, figs. 3*).—Data are presented on the progress made in studies relating to the breeding and selection of strains of watermelons more resistant to wilt, by J. J. Wilson; the physiologic specialization and parasitism of crown rust of oats, and the making of new strains of oats resistant to it by selection and hybridization, both by H. C. Murphy; the control of scab and black scurf of potatoes, by C. S. Reddy; the host response and control of leaf spot of sugar beets, by W. J. Henderson; the breeding of sugar beet strains resistant to *Cercospora* leaf spot and the host range and intertransmissibility of *Cercospora* spp., by S. M. Dietz and Henderson; diseases of the sugar beet crop due to species of *Phoma*, *Rhizoctonia*, *Pythium*, etc., in their relation to *Cercospora* leaf spot, and the development and testing of dust fungicides for control of seed-borne diseases of wheat and oats, both by Reddy; the propagation of disease-free sweetpotato seed stock, by Wilson; control of cherry canker and other nursery diseases, G. L. McNew; varietal tolerance to pink root of onions, by I. E. Melhus and Henderson; factors influencing resistance of strains of corn to *Ustilago zeae*, by Melhus and G. N. Davis; *Diplodia* dry rot of corn, by Melhus; physiological response of the growing plant and the pathogen to chemical treatments of seed corn, and the pathogenicity of *Basisporium gallarum* to corn, both by Reddy; the tree diseases of Iowa, by Reddy, McNew, Davis, Melhus, and G. C. Decker; the effect of organic mercury dusts on seeds of oats, barley, flax, and corn, by R. H. Porter; control of gladiolus disease in Iowa, by Reddy; cedar rust, scab, and root necrosis of apple trees in Iowa, by McNew; a survey of flax diseases in Iowa, and new barley varieties for Iowa, with reference to scab resistance, both by Reddy; the development of laboratory technics for the detection of seed-borne plant pathogens, by Davis and Porter; the influence of pythiaceous damping-off fungi on seedlings of legumes, by Melhus and W. F. Buchholtz; and a genetic investigation of bacterial wilt resistance in corn, by E. W. Lindstrom.

[Phytopathological studies by the Missouri Station] (*Missouri Sta. Bul. 358 (1935), pp. 38–41, 84, 112, 113*).—Progress reports are made on the morphology and physiology of the genus *Phytophthora*, cankers of sweet cherry and apple trees, and the control of smuts of small grains, all by C. M. Tucker; the control of damping-off of the seedlings of tomatoes and other crop plants, by Tucker and C. G. Schmitt; factors influencing the viruses of plant diseases, by C. G. Vinson; and the identification of, and notes on, a number of diseases new or unusual in Missouri, by Tucker.

[Plant pathology studies by the New Mexico Station] (*New Mexico Sta. Rpt. 1935, pp. 29, 31–33, 33, 34, fig. 1*).—Progress reports are given of studies on the histology, biochemistry, and control of psyllid yellows and on the control of early blight of potatoes; on the etiology and histology of apple measles; on the control of chlorosis of Concord grapes; and on root rots of sweetpotato and alfalfa.

[Phytopathological studies by the South Carolina Stations] (*South Carolina Sta. Rpt. 1935, pp. 34, 36, 38–43, 103, 142, 143, figs. 2*).—Brief progress reports are given of studies of downy mildew of tobacco, by G. M. Armstrong and C. B. Sumner; cotton seedling diseases (including damping-off and the distribution of boll rots in South Carolina, varietal resistance to damping-off, cottonseed treatment, seed storage and the effects of origin of seed on the germination and internal infection by organisms, and laboratory tests with the anthracnose fungus *Glomerella gossypii* and other organisms), by C. H. Arndt; a summary of a plant disease survey in the State; and downy mildew (blue mold) of tobacco, by W. M. Lunn, U. S. D. A. Bureau of Plant Industry.

The following studies at the Truck Experiment Station are also included: Bean diseases, by W. D. Moore (U. S. D. A. Bureau of Plant Industry); and potato disease control (including seed treatment for *Rhizoctonia* and dusting for late blight), and downy mildew control on cucumbers, both by Moore and F. E. Johnstone, Jr.

[Phytopathological and physiological studies by the Texas Station] (*Texas Sta. Rpt. 1934, pp. 58, 64, 78–101, 170–175, 207, 208, 240–242, 253, 254, 266, 267*).—Progress reports on the following subjects are given: Fertilizer experiments in the control of cotton root rot and factors affecting the presence of the disease in alluvial soils, both by H. E. Rea; plant pathological and physiological studies are reported by various authors (J. J. Taubenhaus, W. N. Ezekiel, J. F. Fudge, L. E. Brooks, W. R. Horlacher, H. B. Parks, L. B. Loring, E. C. Wood, H. F. Morris, P. Decker, J. N. Roney, L. R. Hawthorn, and G. T. Boyd) on cotton root rot disease (including the spread and persistence of *Phymatotrichum omnivorum* in its vegetative stage, nursery plants as possible carriers, persistence as affected by additions to the soil of fertilizers and other salts, the chemical composition of normal cotton roots and roots in various stages of decay from *Phymatotrichum* root rot and *Fusarium* wilt, the chemical composition of normal apple roots and of those in various stages of decay from *Phymatotrichum* root rot, effect of high concentrations of fertilizer and other salts on the growth of this fungus in Mason jars, the occurrence of field sclerotia in different types of soil, laboratory studies on the longevity of the sclerotia, fungi associated with *P. omnivorum* and the possible perfect stage, the effect of X-rays and of radium on *P. omnivorum*, the toxic principles determining immunity to this root rot in monocotyledonous plants, the composition of soils from root rot and non-root rot areas in the same field, the susceptibility of California wild cotton to root rot, *Bauhinia purpurescens* as a new host of *P. omnivorum*, control of root rot by long rotation with sorghum, effect of flooding on its control, graminaceous barriers and sulfur slabs to prevent the spread of root rot, laboratory studies on the fungicidal value of certain volatile chemicals for the

fungus, preliminary field trials with pentachlorethane, tetrachlorethane, and xylene for the eradication of root rot and their effects on host plants, field plat tests with organic mercury compounds and copper sulfate and the residual fungicidal effectiveness of these preparations and of pentachlorethane at different depths in the soil); the effect of cotton wilt on the quality of the lint and seed, by O. T. Killough, Taubenhaus, and Ezekiel; tomato diseases (including the seeds as possible carriers of *Fusarium* wilt, selection for wilt resistance, the effects of sulfur dusts and of various combinations on the control of field diseases, dusting and spraying of tomatoes in eastern Texas, control of leaf mottle, seed treatment for damping-off, and a leaf and fruit spot on tomatoes, cantaloups, and lima beans of suspected virus nature); a study of the micro-organisms of moldy sorghum and other feeds: sulfur as a fungicide (including sulfur toxicity as affecting spore germination, the relative susceptibility of plants to foliage burn, the "Old Georgia muskmelon" as resistant to sulfur burn, the effect of seed treatment with sulfur and cuprous oxide on the control of sorghum smut, the effect of soil application of sulfur on the control of *Actinomyces* scab on potatoes and of chlorosis and leaf spot of strawberries, tests with sulfur and iron sulfate for eggplant "yellows", and work with sulfur bricks for the eradication of nutgrass and as a barrier against *Phymatotrichum* root rot); diseases of roses (including the etiology of die-back in Texas and the effect of spraying and pruning on its control); miscellaneous disease investigations (including *Sclerotium bataticola* as a seed-borne organism, testing of Iowa wilt-resistant watermelons in Texas, leaf temperature of watermelon plants with *Fusarium* wilt, watermelon seeds as possible carriers of this *Fusarium* wilt, charcoal rot of citron due to *S. bataticola*, a leaf blight of carrots, the etiology of pink root of onions, leaf blight of onions, peach mosaic, smut on horned rush (*Rhynchospora corniculata interior*) due to *Testicularia cyperi*, control of *Sclerophoma* blight of Texas bluebells, a crown and root rot of coleus, poinsettias, and begonias, control of leaf and stem blight of conifers due to *Pestalozzia funerea*, twig blight of cedar elm (*Ulmus crassifolia*) apparently due to a new species of *Septobasidium*, *Rhizoctonia* decay of *Hemerocallis* roots, Cupro-jabonite as a possible control agent for iris rot, live oak disease at Austin apparently of fungus origin, black crown rot of snapdragons due to *Myrothecium roridum*, leaf spot of German statice due to *Cercospora statices*, stem and twig blight of pussy willow (*Salix discolor*) due to *Diplodia salicina*, and fasciation of fall cosmos and other plants and its etiology); an annotated list of 20 plant diseases not previously reported for Texas; and the effect of soil acidity or alkalinity on seedlings of cotton, corn, and cowpeas. Cotton root rot investigations at Temple included studies of the factors affecting the presence or absence of cotton root rot disease in alluvial soil and transportation of root rot sclerotia by run-off water, both by H. E. Rea; work on mechanical separation of sclerotia from the soil, viability tests of sclerotia in relation to time, to different depths in the soil, and to different cropping systems, the appearance of root rot after 7 yr., and soil temperature as affecting the sclerotial production, all by C. H. Rogers; miscellaneous crop diseases, by Rogers and S. E. Wolff; and root rot in rotated v. continuous cotton, by H. Dunlavy. Work at Nacogdoches, reported by J. T. Vantine, included that on the control of damping-off in the tomato seedbed, the selection of tomato strains resistant to *Fusarium* wilt, and data on losses from southern blight. Cotton root rot investigations at Weslaco reported by W. J. Bach, included grape and citrus rootstock resistance tests against *Phymatotrichum omnivorum*, the resistance of winter and summer cover crops and of ornamentals to root rot, the effect of crop rotation on root rot, occurrence on vegetable crops, soil moisture determinations on root rot plantings, and injections of fig trees with various chemicals to determine their

possible fungicidal effects against root rot. Root rot studies at Iowa Park, reported by Taubenhaus and Brooks, included a cotton flooding experiment, grape resistance tests, sorghum as a root rot control, and root rot on *Sesbania*. At Winter Haven data are reported by Hawthorn and Taubenhaus on studies of pink root of onions and eggplant yellows.

[Phytopathological studies by the Washington Station] (*Washington Sta. Bul. 325 (1935), pp. 50–53, 67*).—Notes are given on studies of wheat smut, by F. D. Heald, C. S. Holton, and E. F. Gaines; pear rots, by Heald and H. English; bitter pit and related diseases of apple and pear, by Heald and R. Wellman; virus diseases of potato, by L. K. Jones and C. L. Vincent; downy and powdery mildews of peas, by Jones and L. Campbell; virus diseases of peas, by Jones and F. Johnson; mosaic of black raspberries, by Jones; and the plant disease survey, including virus, parasitic, and nonparasitic diseases, not previously reported for the State, by Heald, Jones, and G. A. Huber. The results of lime-sulfur spraying of cranberry bogs at the Cranberry-Blueberry Substation are reported.

[Phytopathological studies at the Wyoming Station] (*Wyoming Sta. Rpt. 1935, pp. 8, 9*).—Notes are given on the control of cottonwood chlorosis by iron salts; seed treatment for wheat bunt; seed treatment of beans, peas, field corn, and sweet corn; and treatment of seed potatoes for *Rhizoctonia*.

Plant diseases recorded in New South Wales, R. J. Noble, H. J. Hynes, F. C. McCleery, and W. A. Birmingham (*N. S. Wales Dept. Agr., Sci. Bul. 46 (1934), pp. 47, pl. 1*).—Realizing the urgent need for publication of the present position in respect to the plant diseases known to occur in New South Wales, the authors here give an annotated list of over 1,260 diseases arranged alphabetically under the scientific names of their hosts. An index includes the common names of host plants; the genera of bacteria, fungi, and nematodes; and virus, nonparasitic, and undetermined diseases.

[Report of the] mycological laboratory, G. H. Cunningham (*New Zeal. Dept. Sci. and Indus. Res. Ann. Rpt., 9 (1934–35), pp. 25, 26*).—This comprises progress reports of studies of diseases of various crop and ornamental plants, including a turnip mosaic shown to be due to a virus transmitted by aphids; sore shin of blue lupine shown to be due to the pea-mosaic virus, the host range of which was extended to include also sweet peas, alsike clover, and subterranean clover; and a new mosaic of French beans transmitted mechanically.

Studies on the control of root rot diseases of cereals caused by Fusarium culmorum (W. G. SM.) Sacc. and Helminthosporium sativum P, K, and B, I, II, F. J. Greaney and J. E. Machacek (*Sci. Agr., 15 (1934), No. 4, pp. 228–240; Fr. abs., p. 240; 15 (1935), No. 6, pp. 377–386, figs. 2; Fr. abs., p. 386*).—Two papers are here noted.

I. *Field methods with root rot diseases.*—The results are discussed of a 3-yr. study of field methods as applied to these diseases, in which special attention was given to the arrangement of the experiments, planting methods, soil infestation, harvesting, and recording, and to the analyzing of the experimental data.

The extent of disease was expressed as a disease rating representing the percentage of the total number of plants infected and also the degree of infection. Each year the disease rating in a series of plats of Marquis wheat was varied by various devices to introduce root-rotting fungi into the soil. The disease ratings of the plats were correlated with the yields, and the results are summarized in the form of correlation coefficients. The values of these coefficients proved highly significant, and it is thus concluded that the disease rating is an accurate measure of the amount of root rot caused by these fungi, which are demonstrated to have a marked detrimental effect on yields.

Of the procedures used to induce severe attacks in the field, the seed spore-suspension method of introducing the fungus into the soil proved most satis-

factory with *F. culmorum*. With *H. sativum*, most satisfactory results were obtained by a combination of seed inoculation by a suspension of conidia with the application of oat-hull inoculum to the soil, but no method tried gave a real epidemic of root rot with this fungus.

The study as a whole emphasizes the value and importance of plat arrangement and of the application of statistical methods to the interpretation of field experiments with these diseases.

II. *Pathogenicity of Helminthosporium sativum as influenced by Cephalothecium roseum Corda in greenhouse pot tests.*—The methods and analysis used in pot-culture experiments with cereal root-rot fungi and the results of the greenhouse tests here reported are discussed in detail. A fast-growing strain of *H. sativum* proved distinctly pathogenic on wheat, yet its pathogenicity was suppressed by the antagonistic action of *C. roseum*. Preliminary studies showed that staling products of the latter on liquid media were exceedingly effective in inhibiting the germination and germ tube growth of spores of *H. sativum*, suggesting that their toxicity was the chief factor in suppressing its pathogenicity. These pot-culture experiments are believed to have demonstrated that *C. roseum* exerts a measure of biological control over *H. sativum*.

Studies on Helminthosporium root-rot of wheat and other cereals, I, II, H. J. HYNES (*N. S. Wales Dept. Agr., Sci. Bul. 47 (1935), pp. 39, pls. 4, fig. 1*).—The following two parts are included:

I. *Economic importance, symptoms, and causal organisms.*—The principal fungi found associated with root rots of cereals and grasses in New South Wales are *Ophiobolus graminis, Fusarium culmorum, Rhizoctonia solani, Helminthosporium M, H. sativum*, and *H. tetramera*. The estimated economic losses caused by, and the comparative symptomatology of, these organisms are discussed.

II. *Physiologic specialization in Helminthosporium spp.*—Physiologic specialization was studied in 16 isolates of *Helminthosporium M*, 54 of *H. sativum*, and 5 of *H. tetramera*. Comparisons of colony characters on three media, each at 25° and at 15° C., resulted in the differentiation of 11 physiologic forms of *Helminthosporium M*, 31 of *H. sativum*, and 5 of *H. tetramera*. Saltation occurred in certain isolates of each species and was more frequent at 25° than at 15°, although fairly common at 15°. In the first two species different isolates of a physiologic form exhibited wide differences in colony diameter under similar treatment. Pathogenicity tests indicated *Helminthosporium M*, as a group, to be more virulent than either of the other two species. No correlation between the degree of virulence and the rate of growth on agar was observed for the isolates of one form. The infection capabilities of a mass collection of cultures could not be predicted from performance on agar media.

Inheritance of resistance to bunt, Tilletia tritici, in hybrids of Turkey wheats C. I. 1558B and C. I. 2578, F. N. BRIGGS (*Hilgardia [California Sta.], 10 (1936), No. 1, pp. 19–25, fig. 1*).—Both these varieties of wheat were found to depend on the Turkey factor only for their resistance to bunt, making a total of five varieties found to have the Turkey factor—all of the Turkey type of wheat.

One variety (Sherman) of the Turkey type was found to possess the Martin factor for resistance. Thus two of the three major factors discovered by the author (E. S. R., 70, p. 603) are now known to occur in Turkey wheats. Therefore it should be relatively easy to combine these into a single variety of the Turkey type.

Colletotrichum graminicolum (CES.) Wils. as a parasite of the stem and root tissues of Avena sativa, G. B. SANFORD (*Sci. Agr., 15 (1935), No. 6, pp. 370–376, figs. 3; Fr. abs., p. 376*).—This report provides evidence, secured

since the preliminary note (E. S. R., 71, p. 53), that *C. graminicolum* may cause the root rot and stem disease of oats described as prevalent in the black soil area near Edmonton, Alberta.

These studies showed the fungus to be a typical soil inhabitant. Inoculations in open pot culture in the greenhouse induced symptoms fairly typical of the spontaneous field infections, and microscopic studies of both field and greenhouse material indicated that the fungus can cause definite injury to seedlings and to some extent to mature plants.

The cortex of the young seminal roots and of the stem between the scutellar and crown nodes appears to be most easily and severely affected, and, except for a transient host-parasite compatibility there is a complete and early collapse of the cortical and endodermal cells, with accompanying disintegration of the invading hyphae. While the stereome and the vascular bundle elements offer some resistance, they are all penetrated, but, in contrast to the cortex, the cells remain apparently intact and the hyphae do not disintegrate.

The evidence secured indicates that in seedlings under field conditions the early browning of the roots and the stunting of the plants are due mainly, if not wholly, to the practical destruction of the seminal roots and the injury of the stems below ground. The tendency toward later recovery is undoubtedly explained by the development of adventitious roots, which usually are not severely penetrated.

Studies on the physiology of the oat smuts, W. Popp and W. F. Hanna (*Sci. Agr., 15 (1935), No. 6, pp. 424–434, figs. 3; Fr. abs., pp. 433, 434*).—"The sporidia were removed from the promycelia of individual germinating chlamydospores of *Ustilago avenae* and *U. levis* and cultured separately on nutrient agar. Oat seedlings inoculated with these cultures were grown to maturity. Plants inoculated with single monosporidial cultures of *U. avenae* or *U. levis* failed to produce smutted heads. Plants inoculated with two monosporidial cultures of opposite sex of *U. avenae* or *U. levis*, or with a culture of *U. avenae* and one of opposite sex of *U. levis*, produced smutted heads. Heads infected with *U. avenae* or with the hybrid (*U. avenae* × *U. levis*) contained echinulate chlamydospores; those infected with *U. levis* contained smooth chlamydospores. Proof of the dominance of the factor for echinulate spore over that for smooth spore was obtained by backcrossing cultures of the F_1 hybrid (*U. avenae* × *U. levis*) with cultures of *U. avenae* and *U. levis*.

"The appearance of smutted heads, whether 'covered' or 'loose', is not always a reliable indication of the kind of chlamydospores which they contain. However, plants inoculated with cultures bearing the factor for echinulate spore produce a higher proportion of heads of the loose type than do those inoculated with cultures bearing the factor for smooth spore. There is evidence that the appearance of smutted heads is determined by the conditions under which the plants are grown, as well as by the genetic constitution of the smut fungus attacking them.

"The sporidia of *U. avenae*, like those of *U. levis*, are of two kinds, (+) and (—); the sporidia of the one species mate without difficulty with sexually opposite sporidia of the other species. Segregation for sex and cultural characters (sporidial and hyphal types of colonies) was found to occur at either the first or the second division of the chlamydospore nucleus.

"No significant difference was found in the ability of *U. avenae*, *U. levis*, F_1 (*U. avenae* × *U. levis*), F_2 (*U. avenae* × *U. levis*), and F_1 (*U. avenae* × *U. levis*) × *U. levis* spores to germinate, but sporidia of the F_1 (*U. avenae* × *U. levis*) spores, as compared with those of the others, are much less capable of growth on artificial media."

Secondary tumor formation on herbaceous hosts induced by Pseudomonas tumefaciens Sm. and Town, R. F. SUIT and E. A. EARDLEY (*Sci. Agr., 15 (1935), No. 6, pp. 345–357, pls. 2; Fr. abs., p. 357*).—Since the secondary tumors developing in a series of apple trees following inoculations with *P.* [*Bacterium*] *tumefaciens* could scarcely be explained on the basis of tumor strands or elongation of a growing point (none having been involved), experiments to elucidate the problem were initiated at the Iowa State College and continued at Macdonald College, Quebec, using the following inoculated herbaceous plants: Paris daisy, tomato, tobacco, and *Bryophyllum calycinum.*

Movement of the organism through the vessels of the xylem was demonstrated by isolations at various distances from the point of inoculation, by the development of secondary tumors, and by histological studies. Such movement was influenced by the transpiration stream, the number and size of the vessels, and the vascular anatomy of the host stem. In some cases *P. tumefaciens* remained viable in the tissues of apparently normal internodes of tomato plants without producing visible disease symptoms for at least 10 weeks.

From available information regarding secondary tumor formation, there appear to be three ways in which they may form: (1) By elongation of the inoculated tissue, (2) by migration for short distances as zoogloeae from inoculation points in the cortex, and (3) by movement for considerable distances in the vessels as reported in this study. Three types of this third method of secondary tumor formation were demonstrated: (1) External tumors, arising from wounds from the exterior, which break the vessels; (2) internal tumors at breaks in the vessels of the protoxylem; and (3) extruding tumors which originate from the xylem as adventitious growths.

The physiology of Rhizoctonia solani Kühn, III, IV, W. NEWTON and N. MAYERS (*Sci. Agr., 15 (1935), No. 6, pp. 393–398, figs. 2; Fr. abs., p. 398; 399–401; Fr. abs., p. 401*).—The following two papers are included:

III. *The susceptibility of different plants as determined by seedling infection.*—The results of tests to determine the susceptibility of seedlings of different plants to *R. solani*, in order to find resistant crops for planting in rotation on infected soils, were as follows: Seedlings of wheat, oats, red clover, crimson clover, Mammoth White Dutch clover, alfalfa, and barley appeared to be immune or highly resistant when grown on infected soil; sunflower and ryegrass were fairly resistant; and peas, beans, vetch, buckwheat, timothy, millet, and corn were moderately or highly susceptible to infection. Turnips and carrots were markedly stunted when grown on infected soil but showed no lesions or other symptoms of infection.

The growth of seedlings on inoculated nutrient agar proved to be an unsatisfactory method for determining relative resistance. For example, clover and sunflower showed a maximum susceptibility, though they are highly resistant when grown on infected soil.

IV. *The effect of a toxic substance produced by Rhizoctonia solani Kühn when grown in liquid culture on the growth of wheat, carrots, and turnips.*—Heat-sterilized filtrates of old, liquid cultures of *R. solani* proved markedly toxic toward seedlings of carrots and turnips as compared with wheat. Hot water extracts of washed, dried, and ground mycelia were also toxic to turnips, but at the concentrations used no evidence of toxicity to wheat was noted. These data suggest that a heat-stabile toxin is secreted by the fungus during growth and that it is also present in the mycelium. This toxin may serve to determine the relative immunity of different plants to the fungus, since previous studies (see above) indicated that carrots and turnips are markedly stunted on soils infected with the living fungus while under the same conditions wheat was not affected.

The identification of certain viruses affecting leguminous plants, W. H. PIERCE (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 11, pp. 1017–1039, figs.* 7).—The investigations here reported from the Idaho Experiment Station were concerned primarily with the differentiation and identification of seven viruses affecting leguminous plants, viz, the common bean mosaic virus (Bean Virus 1); the yellow bean mosaic virus (Bean Virus 2); a white clover mosaic virus (White Clover Virus 1); enation pea mosaic virus (Pea Virus 1); common pea mosaic virus (Pea Virus 3); the common soybean mosaic virus (Soybean Virus 1); and a virus obtained from red clover designated as the broadbean local-lesion virus. Differentiation was based on symptom expression in differential hosts, varietal susceptibility of peas and beans, susceptibility of certain leguminous plant species, and on certain properties of the viruses in vitro.

Pea viruses 1 and 3 were not transmissible to beans by the artificial inoculation methods used. Differentiation of Pea Virus 1 from Pea Virus 3 was based on the resistance and susceptibility of pea varieties and on the difference in host range. Bean Virus 1 and Bean Virus 2 were readily differentiated on the basis of susceptibility and resistance of bean varieties. White Clover Virus 1 was differentiated from the other viruses studied by its ability to infect all varieties of beans and peas tested, and on the basis of symptom expression. The broadbean local-lesion virus differed from all others studied in its ability to produce local necrotic lesions at the points of inoculation on the small-seeded broadbean. Soybean Virus 1 appeared to be specific to soybean.

The differences in host ranges of the viruses were supported in part by differences in symptom expression, in longevity in vitro, and in some cases by slight differences in thermal death points. The differences are believed sufficient to allow recognition of these viruses by others.

Follicular (oestrus) hormone and plant tumours, L. HAVAS (*Nature* [*London*], *136* (*1935*), *No. 3439, p. 516*).—The mean weight of the uppermost tumors on plants treated with oestrus hormone before inoculation with *B*[*acterium*] *tumefaciens* was about 80 percent greater than that of tumors below the petiole. In the controls without hormone treatment, the weights of the tumors were not significantly a function of their position.

Distribution and effect of petroleum oils and kerosenes in potato, cucumber, turnip, barley, and onion, P. A. YOUNG (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 10, pp. 925–934, pls. 3*).—Undiluted oils and cresoap emulsions of petroleum oils were tested on potato leaves at the Montana Experiment Station to determine (1) the rates of oil penetration into leaves, (2) the symptoms induced, (3) the oils and their concentrations that potato leaves tolerate without necrosis, and (4) a rapid, easy, accurate method for predicting the probable injury that an oil spray will cause in potato leaves. Thirty-six kinds of petroleum oils and kerosenes ranging in viscosity from 31 to 410 sec. and in sulfonatable residues from 0 to 53 percent were tested to determine their distribution and effect on various plant species. The symptoms in potato leaflets and the effects on potato yields are described in detail.

A convenient method of testing the toxicity of oils and kerosenes before they are sprayed on potato leaves is to place drops of each oil and drops of unsulfonatable oil on healthy potato leaves and to observe the comparative symptoms. Oils that cause more than a few necrotic symptoms within the first few days probably are too toxic for commercial sprays on potato leaves. Slightly toxic oil may be used safely in sprays of 1 percent on potato leaves.

Kerosenes penetrated potato leaves rapidly, but soon evaporated. In contrast, lubricating oils penetrated more slowly but remained in the leaves for a much longer time. Studies of these plant species revealed that the petroleum oils were mainly between the parenchyma cells, but also were inside the tracheae

and parenchyma cells. Evidently the oils are conducted mainly between the cells in passing from the leaves into the roots.

The physiology of bean mosaic, A. L. HARRISON (*New York State Sta. Tech. Bul. 235 (1935), pp. 48, figs. 10*).—From these comparative studies of healthy and mosaic-infected Stringless Green Pod Refugee beans, the following results were obtained:

The subjection of infected seeds to 100° C. for several hours, to formaldehyde, and to X-rays failed to inactivate the virus or to eliminate infected seeds. Flotation methods failed to separate out the latter by any specific gravity differences.

The percentage of dry matter in the tops of infected plants from seedling to blooming stages was significantly less than in healthy plants. Infected leaves transpired distinctly less per unit of surface and per gram of dry weight than healthy leaves whether or not they were detached from the plant, but the pods of infected plants transpired more rapidly per unit of surface and gram of fresh weight than healthy ones of the same size. The reduction in number of open stomata on infected leaves probably accounts for their lowered transpiration rate, but the increased rate in infected pods is believed to be associated with the osmotic concentrations and the ability of the cells to hold water. In infected leaves, the light-green areas transpired significantly less than the dark-green.

More of the blooms on infected plants were deformed, and infected pods tended to become curved, misshapen, rough, and edematous. A water-soaked appearance ("hydrosis") of the pods was constantly associated with mosaic under certain conditions, being more severe in pods or plants infected in or just prior to the blooming stage than in those infected in the seed or seedling stage. On the average, mosaic caused a delay of several days in blooming when infection occurred in the seed or seedling stage, but if infected while blooming the plants ceased blooming for several days, followed usually by a second blooming period. Diseased plants frequently produced more blooms per plant and per gram of dry matter than healthy plants. The pod yield per gram of dry weight was approximately the same, but the yield per infected plant was materially reduced because of the stunting effect of mosaic. The delayed maturity of infected plants is due to delay in blooming.

The mosaic mottling was nearly masked at 15° and 30° but was very distinct at 20° and 25°. At 30° the leaves on both healthy and infected plants were too badly rolled for observations, but no rolling of the healthy leaves occurred at any of the other temperatures. The degree of rolling in infected leaves increased with the raising of temperature from none at 15° to severe rolling at 30°. Mosaic symptoms were more pronounced at 2.5 ft. than at 4 ft. from the light source. Unlike light intensity, length of application apparently is not an important factor, since the symptoms developed approximately the same in an 8-hr. as in a 12-hr. day.

Transmission of bean mosaic, A. L. HARRISON (*New York State Sta. Tech. Bul. 236 (1935), pp. 19, figs. 3*).—The host range of bean mosaic in New York State is not definitely known, but in the vicinity of Geneva, except for white sweetclover, it has not been found on any other legumes. The mosaic viruses of red clover, alsike clover, white sweetclover, and black medic were repeatedly transmitted to beans through pea aphids, but only with difficulty by mechanical means. The disease produced in these cases was similar to, or identical with, the yellow bean mosaic. It thus appears that white sweetclover may be susceptible to both the common and the yellow bean mosaic. The viruses of pea and alfalfa mosaics were not transmitted to beans through

either pea aphid or hand inoculation, nor was a seed-borne soybean mosaic transmitted mechanically to beans.

Bean mosaic was transmitted very irregularly through the seeds. The early formed pods on seed-infected plants transmitted mosaic to a larger percentage of their seeds than did the late-formed pods. The virus extract from young seedlings possessed a higher degree of infectivity than that from plants in the blooming or podding stages.

In the field, bean mosaic was spread chiefly by aphids, but to some extent also by mechanical means. Its spread was greatly reduced in fields or portions of fields exposed to the wind, and it was apt to spread much faster in bean fields close to clover or alfalfa fields (especially on the leeward side) than in bean fields at some distance. These factors probably affect the spread of mosaic through their influence on the breeding and migration of aphids.

Mosaic of the Refugee bean, A. L. HARRISON (*New York State Sta. Bul. 656 (1935), pp. 19, figs. 7*).—The symptoms of bean mosaic, a disease causing serious injury to the Stringless Green Pod Refugee variety in New York, are described in some detail. The crops affected by the disease, its transmission, its effects on the yield, quality, and maturity of the beans, and suggested control methods are discussed.

The planting of mosaic-free seed supplemented by field roguing was successful only where the mosaic did not spread very rapidly. However, marked progress is reported in the development of mosaic-immune stocks by breeding and selection.

The technical aspects of these studies are summarized in the two preceding abstracts.

Borax or borax-superphosphate in the control of heart and dry rots of beets (summer of 1935): Methods and results of its use [trans. title], E. D. DOERELL (*Deut. Landw. Presse, 62 (1935), No. 49, pp. 599, 600*).—In the tests reported, better results were obtained by the use of borax mixed with superphosphate or in a superphosphate fertilizer mixture. Applied in this manner, the results are more certain, the borax is evenly distributed and placed in the soil layers where it is more effective, and all fears as to any injurious aftereffects are believed to be practically groundless. The formula recommended is 1 part of borax to 10 parts of superphosphate.

Histology of the caryopsis of yellow dent corn, with reference to resistance and susceptibility to kernel rots, H. JOHANN (*Jour. Agr. Res. [U. S.], 51 (1935), No. 10, pp. 855–883, figs. 19*).—The kernels examined were for the most part from hand-pollinated ears of yellow dent corn grown at Madison, Wis., and at Bloomington, Ill. During the summers of 1930–33 specimens were collected from strains that had shown resistance to ear rots in the field over a period of years and from those that had proved susceptible under comparable conditions. The earliest collection was made 2 days after pollination.

Serial sections of the ovary showed that the outer integument covers all but a narrow triangle of the surface of the inner integument and that the two integuments degenerate at about the same time. Of these, the only part that persists is a very thin suberized layer, the semipermeable membrane of the testa, which had been formed along the inner wall of the inner integument in close contact with the epidermis of the nucellus.

Diplodia zeae usually enters the kernel through the spongy tissue at the proximal end of the caryopsis and advances into the embryo either through penetration of the suberized membrane of the testa or by way of the open hilar orifice. As the kernel matures the wide hilar orifice is closed by a thick, brownish layer formed by the radial crushing of parenchymatous

tissue of the pericarp. It is waxy in appearance and more resistant to hyphal penetration than the adjoining suberized membrane.

Though, in general, it was in those strains known to be most susceptible to ear rots in the field that a delayed or less effective closing of the hilar orifice was found, the material failed to show anatomical differences sufficient in themselves to account for the high degrees of resistance or susceptibility to *Diplodia* kernel rot manifested in the field. It is therefore suggested that differences in the host-fungus relationship may be tied up more closely with the chemical medium offered by the host in its relation to the nutritional requirements of the fungus than with the anatomical differences in kernel structure.

Relation of the occurrence of cotton root rot to the chemical composition of soils, G. S. FRAPS and J. F. FUDGE (*Texas Sta. Bul. 522 (1935), pp. 21, figs. 2*).—In this study of the soil relations of *Phymatotrichum omnivorum*, "the principal soil types of Texas were grouped according to the degree of damage caused by cotton root rot. On an average, soils on which no damage was caused by the disease contained only about two-thirds as much total phosphoric acid, one-half as much nitrogen, total potash, and magnesia, one-third as much acid soluble potash, one-fifth as much active phosphoric acid and active potash, one-seventh as much lime and basicity, and seven times as great a concentration of hydrogen ions in the soil suspension as did soils on which damage was high. The average composition of soils on which medium and low degrees of damage were caused by the disease was, in general, intermediate between that of the soils in the high damage and no damage groups, although several exceptions occur."

Soft rot of potatoes caused by Pythium ultimum Trow, W. JONES (*Sci. Agr., 15 (1935), No 6, pp. 402–410, figs. 2; Fr. abs., p. 410*).—The author describes a soft rot of potato tubers found during harvesting and storage and of cut pieces after planting. His investigation showed it to be fairly widespread in British Columbia and to cause considerable injury in some districts The pathogenicity of the fungus was established and infection shown to be very rapid at the optimum temperature (from 25° to 31° C) for the fungus growth, complete disintegration sometimes occurring within 4 days. The optimum pH for fungus growth lay between pH 6 and 8, the maximum above pH 9, and the minimum between pH 3 and 4.

All of 15 potato varieties tested proved susceptible to infection with the fungus, which also caused disintegration of roots of mangels, beets, and carrots. Uninjured tubers did not become infected in inoculated soil. Treating cut sets with $HgCl_2$ solutions and pastes of various concentrations failed to control infection effectively Dusting the cut sets with sulfur reduced the infection when they were not planted for 24 hr. after treatment. Untreated cut sets allowed to dry for 48 hr. before planting were readily attacked by *P. ultimum*, as well as by secondary invaders, but when they were allowed to form a callus at room temperature and high humidity for 48 hr. before plainting infection was greatly reduced. Infection of freshly cut pieces took place in wet and in very dry soils, but there was slightly less in the latter case.

Since the maximum and minimum temperatures for growth of the fungus are 40° and 4°, respectively, storage at or below the latter temperature is recommended.

Diseases of the potato plant at Cameron Highlands, A. THOMPSON (*Malayan Agr. Jour., 23 (1935), No. 9, pp. 410–420, pl. 1*).—The climatic conditions in Malaya are unsuited to potato growing except at elevations of 3,000 ft.

or more. Three diseases (blight due to *Phytophthora infestans*, bacterial wilt due to *Bacterium solanacearum*, and leaf disease due to *Macrosporium* (*Alternaria*) *solani*) which have appeared on potatoes at Cameron Highlands are described, and measures for prevention and control are given. Four other common diseases (wart, leaf curl or leaf roll, mosaic, and scab), not yet reported locally but likely to appear, are briefly described and control measures suggested.

Toxicity of aluminum salts to tobacco plants, W. S. EISENMENGER (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 10, pp. 919–924, figs. 2*).—In tobacco plants grown at the Massachusetts Experiment Station alternately for 2 days in a complete nutrient solution and for 2 days in solutions containing different percentage proportions of 0.006 M aluminum citrate, no perceptible increase in growth rate but definite toxic symptoms were observed at low concentrations of aluminum.

The presence of phosphates lowered the amounts of ionic aluminum in the soil.

From the results of tests with corn, tobacco, timothy, and clover, there is considered to be no justification for the assumption that certain crops give rise to active aluminum when the same soil type is used for their culture.

Tests with tobacco plants grown in complete nutrient solutions in which the proportions of calcium nitrate and aluminum citrate were varied indicated that the calcium ion may function to some extent in reducing the toxic effects of aluminum. In these tests low concentrations of aluminum seemed to increase the growth rate slightly.

No relation between the aluminum content of the soil solution and the occurrence of brown root rot of tobacco was indicated by soil analyses.

Evidence of virus mutation in the common mosaic of tobacco, H. H. MCKINNEY (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 11, pp. 951–981, figs. 4*).—Twenty-three collections of viruses from different parts of the world, causing common mosaic or similar types of green mosaic on tobacco, were found to induce a few bright yellow or yellowish-green spots of small size on the foliage of each tobacco plant inoculated. Three other viruses causing green mosaics distinctly not of the common type on tobacco failed to induce these yellow-mosaic spots, and the spots contained viruses distinct from the virus of common mosaic. After the isolation and purification of viruses from these spots it was found, through a long series of subinoculations, that new symptoms were consistently associated with the new viruses. Thus the new viruses represent permanent departures from the established type, the essential criterion for mutation. Evidence in support of the view that the virus of common mosaic mutates is based on several lines of experimentation, i. e., (1) the common-mosaic virus is more aggressive than the yellow-mosaic viruses associated with it, thus suppressing their development when they are introduced into the plant simultaneously with it or after it has become established; (2) the dilution-inoculation technic successfully removes yellow-mosaic virus from mixtures with a green mosaic not producing yellow-mosaic spots, but this technic fails to yield a virus of common mosaic producing only green mottling; and (3) *Nicotiana glauca* and *N. sylvestris* serve in two distinct ways as differential plants for common mosaic and yellow mosaic, but the common-mosaic, after passage through these species, continues to produce yellow-mosaic spots on tobacco.

New virus diseases of the tomato, K. M. SMITH (*Jour. Roy. Hort. Soc., 60* (*1935*), *No. 10, pp. 448–451, figs. 7*).—The author describes the symptoms of three new virus diseases of tomatoes, identified from material received from

different parts of Great Britain, in order that growers may recognize them and take steps to destroy infected plants.

A wilt-resistant watermelon for Florida, M. N. WALKER (*Florida Sta. Bul. 288 (1936), pp. 13, figs. 8*).—The author presents a general discussion of the history and nature of this disease, due to *Fusarium niveum*, and a summary of work of the past 5 yr. relative to the development of a resistant variety meeting the market conditions for Florida-grown melons.

Two types were isolated from a promising selection (1931), and sufficient seeds of one of them were harvested in 1935 to plant several acres. The latter type, designated as the Leesburg variety, is wilt-resistant and possesses a lighter color and an increased toughness of the rind. Its characters are illustrated and described in detail.

Mouldy core in Gravenstein apples, K. A. HARRISON (*Sci. Agr., 15 (1935), No. 6, pp. 358–369; Fr. abs., p. 369*).—This abnormal condition has been known by Nova Scotia growers for years. The most severe loss recorded averaged 1 bbl. per tree for a block of 250 trees. The main results of this study to determine the causes of the trouble were as follows:

The percentage of moldy core proved to be directly dependent on that of open core, and the various fungi involved are considered chance invaders (*Alternaria* and *Fusarium* predominating) that rarely parasitize their host. Apples with moldy core average heavier than healthy ones, and on any one tree its incidence was higher in the heavier apples. The open core condition is believed to result from rapid growth at some stage in the development of the apple, causing a break in the tissues of the core that leads to an opening, usually in the calyx tube. The premature coloring of the fruit was closely related to the moldy core and open calyx conditions, but did not invariably follow. Under the 1933 conditions, the average seed content was not correlated with moldy core or with premature drop. Faulty pollination is an important factor in influencing the number of apples that set and thus, indirectly, the size of the individual apples, but it cannot be considered the fundamental cause of moldy core. Premature drop is considered to be partially correlated with premature coloring, both of which indicate early maturity. From 60 to 75 percent of the early matured apples were affected with open calyx and moldy core. These conditions, it is believed, follow too favorable conditions for growth, and the Gravenstein variety is predisposed from its growth habits and the constitutional weakness of the calyx end.

The life history and parasitism of Taphrina deformans, R. E. FITZPATRICK (*Sci. Agr., 14 (1934), No. 6, pp. 305–326, pls. 2, figs. 10*).—The relations of weather conditions in the spring to the occurrence of peach leaf curl on the Niagara Peninsula, the biological potentialities of the spores of *T. deformans*, and the progress of infection are discussed. The fungus was isolated in the winter from washings of buds and bark. Conidia remained viable in sterile soil for more than a year. Artificial infections were obtained with monoascospore cultures. No copulation between conidia was found.

Carefully timed spraying tests indicated that infection occurs just as the leaf buds are unfolding in the spring, and that in this district summer infection rarely, if ever, occurs. A spore germinating on the surface of a young leaf produces a short, peglike hypha which penetrates the cuticle. At the same time the spore nucleus divides, and both nuclei with the rest of the spore contents pass into the cuticle where the end of the penetration tube enlarges into an irregular saclike growth. The fungus then grows down between the epidermal cells and, in the leaf parenchyma, develops an irregular mycelium, which subsequently becomes septate and each cell of which contains one or more pairs of conjugate nuclei.—(*Courtesy Biol. Abs.*)

Further studies on the parasitism of Taphrina deformans, R. E. FITZPATRICK (*Sci. Agr., 15 (1935), No. 6, pp. 341–344, figs. 3; Fr. abs., p. 344*).—Continuing the studies noted above, the following conclusions were drawn:

Since the penetration of young peach leaves occurred readily at from 50° to 70° F., the disappearance of the disease during summer could not be attributed to any inability of the fungus to enter the leaf. Nevertheless, leaves grown at high temperatures developed little or no leaf curl, whereas those grown at lower temperatures became seriously affected. That in the former case the leaves developed so rapidly that their period of susceptibility was passed before the fungus could establish adequate parasitic relationships, and that consequently such infections stopped at the initial stages are interpretations suggested by the well-defined boundaries always existing between the healthy and diseased areas of the mature leaves. This resistance appears to be correlated with the degree of maturity of the tissues, since the tip, which matures earliest, is the most resistant part of the leaf.

The results of these studies are believed to indicate that the prevalence of leaf curl following cold, wet springs is largely accounted for by the slow growth rate of the leaves, presenting optimum conditions for the later stages of infection.

Investigations on [the] black knot of plums and cherries, II–IV, L. W. KOCH (*Sci. Agr., 15 (1934), No. 2, pp. 80–95, pls. 3, Fr. abs., p. 95; 15 (1935), Nos. 6, pp. 411–423, pls. 4, figs. 3, Fr. abs., p. 423; 11, pp. 729–744, pls. 4, fig. 1, Fr. abs., p. 744*).—These studies (E. S. R., 71, p. 339) were continued.

II. *The occurrence and significance of certain fungi found in association with Dibotryon morbosum (Sch.) T. and S.*—*Cephalothecium roseum* appeared consistently during July and August of each year on the conidial stroma of *D. morbosum* in many knots on various hosts, and evidence is given that it actively parasitizes the stroma in nature and the black knot fungus in culture. The natural biological control of black knot by *C. roseum* is brought about by a destruction of the perithecial initials of *D. morbosum* in the conidial stroma, and it is manifested usually by a reduction in numbers and occasionally by a complete inhibition of the perithecia on infected knots.

Over a 4-yr. period a *Coniothyrium* was isolated at will from all except the youngest knots, and at all times of the year from the bark and buds of apparently healthy branches of various species of *Prunus* and *Pyrus*. Its presence during winter in the form of chlamydospores on the bark of these hosts was also demonstrated. A description of the *Coniothyrium* sp. is given. It was proved capable of inducing slight swellings but not typical knots on branches of plum and sour cherry when infection courts were provided. It evinced a mutual tolerance with *D. morbosum* in culture. The two fungi are shown not to be genetically related, but in the older knots the *Coniothyrium* has been observed to produce abundant pycnidia in and around the perithecia of *D. morbosum*.

"A species of *Monilia*, *Hendersonula morbosa* Sacc., *Sphaeronema* sp., *Nectria* sp., *Phoma* sp., *Sporotrichum* sp., *Cladosporium* spp., *Fusarium* sp., *Alternaria* sp., and a *Torula*-like fungus were frequently isolated from black knots. None of these fungi is an imperfect stage of *D. morbosum*."

III. *Symptomatology, life history, and cultural studies of Dibotryon morbosum (Sch.) T. and S.*—The author here reviews the literature, describes the symptoms of the disease, and discusses the taxonomy and the details of his cultural and life history studies of the fungus, the main results of which are as follows:

Over 95 percent of the primary black knot infection was found to occur on the current season twigs, suggesting a high type of parasitism in the fungus. Nearly all the knots resulting from spring infection were detected

in the fall as small swellings on the twigs. Some of these produced abundant conidia the same fall and perithecia during the ensuing winter, thus completing the life cycle on the host within a year.

During the present studies the life history of two ascospores of *D. morbosum* was followed by photomicrographs from the initial germination to the final formation of conidia of the *Hormodendrum* stage from 68 to 74 hr. later. The chlamydospores of *D. morbosum* proved to be viable throughout the winter but were produced in culture only in the presence of certain other organisms or of chemicals. The isolation of four morphologically distinct conidial strains of *Hormodendrum* sp. from monoascospores of *D. morbosum* suggests the occurrence of physiological forms.

IV. *Studies in pathogenicity and pathological histology.*—Experiments involving over 900 inoculations were conducted over a period of 5 yr., various methods of inoculating twigs and branches of plums and cherries with ascospores, conidia, and mycelium of *Dibotryon morbosum* being used. Only one knot followed the inoculation of branches over 1 yr. old with diseased host tissue. The majority of artificially induced knots developed only on current season twigs inoculated with aqueous suspensions of ascospores or conidia. A total of only 3 percent of the ascospore and conidium inoculations gave infection, and although made throughout the year the most of the knots followed inoculations during May. Three knots were produced on old branches of *Prunus domestica* by "patch grafting" tissues taken from just beyond the border of knots.

All artificially induced knots became visible during the fall after inoculation, and many of them produced the conidial (*Hormodendrum*) stage during the fall and the perithecial stage during the following winter, completing the life cycle within 1 yr.

Though relative humidity and temperature are probably most important in the epidemiology of the disease, the host condition is undoubtedly responsible for the limitation of infection to a relatively short part of the growing season. The susceptibility of various wild and cultivated species of *Prunus* is discussed.

The ascospores and conidia were found to germinate on the surface of plum twigs, and under favorable conditions the mycelium reached the cambium, which was then stimulated to produce abnormally large amounts of xylem and phloem. The fungus usually appeared in the host as compound, phalangial, hyphal strands, chiefly radial and always intercellular. In the vicinity of the medullary rays it induced an increase in the size and number of the parenchyma cells and the production of scalariform tracheids which were frequently in contact with the mycelium. After the growing season the fungus advanced through the normal tissues and, though it distorted the elements, caused no visible hypertrophy during the winter. The host and fungus lived in intimate contact for about 6 or 7 mo. before evidencing mutual ill effects—a high type of parasitism.

Control tests indicated the effectiveness of an additional spray application of lime-sulfur (1–50) during "full bloom", as well as the previously recommended "delayed dormant" and "shuck" applications.

Mosaic and related diseases of raspberries in Washington, L. K. JONES and K. E. BAUR (*Washington Sta. Bul. 324 (1936), pp. 19, pls. 8, fig. 1*).—"Virus diseases have been a limiting factor in the growing of raspberries in central and eastern portions of the United States and have caused serious loss in some plantings in Washington. Mosaic is generally present and destructive in eastern Washington, but it also occurs in some of the raspberry-growing

areas west of the Cascade Mountains. Other virus diseases of less importance in Washington are yellow mosaic, leaf curl, and streak.

"Results of observations on trial plantings and commercial fields show that mosaic spreads more rapidly on black raspberries than on red raspberries and more rapidly on Cuthbert than on Marlboro under western Washington conditions, and that it can be eradicated or materially reduced by careful roguing. Of the red raspberry varieties observed, Cuthbert and Marlboro are the most seriously damaged; Latham, Chief, Syracuse, Newburg, and Antwerp are less affected by the disease; and the Lloyd George is free from the trouble. Observations on black raspberries have shown that the Plum Farmer and Munger varieties are seriously damaged, whereas the Cumberland, Dundee, Naples, and Ohio varieties are less damaged by the disease.

"Control recommendations include the use of disease-free nursery stock, the destruction of mosaic-infected plants, the avoidance of the introduction of infective aphids into healthy plantings, and the use of less susceptible varieties, if these are acceptable to the market."

Some aspects of citrus tree decline as revealed by soil and plant studies, W. T. McGeorge (*Arizona Sta. Tech. Bul. 60 (1936), pp. 329–370, figs. 3*).—Analyses showed a lower calcium and a higher water-soluble alkalinity of the ash in chlorotic or otherwise affected as compared to normal citrus leaves, a higher water-soluble alkalinity in the ash of juice from fruits on affected branches, and a higher pH and total acidity (indicating a higher buffered state) of juice from such fruits.

Soils on which citrus chlorosis and crazy top occurred were usually above the average in pH values. A lower calcium and a higher water-soluble alkalinity appear to be characteristic of plants grown on alkaline-calcareous soils. By reducing the pH of the soil solution through irrigation with water containing traces of acid, or through incorporation of sulfur in the soil, the plants absorbed more calcium, iron, and manganese and possessed an ash with lower water-soluble alkalinity.

From the results obtained, it is concluded that the nutritional disturbances known as citrus decline may be corrected in part or as a whole by the use of sulfur or acids.

Experiments in the control of Rhizoctonia damping-off of citrus seedlings, R. Weindling and H. S. Fawcett (*Hilgardia [California Sta.], 10 (1936), No. 1, pp. 1–14, figs. 4*).—At the Citrus Experiment Station, damping-off of citrus seedlings due to *R. solani* was successfully controlled in the laboratory, greenhouse, and field by acidifying the soil layers next to the seeds by aluminum sulfate or acid peat moss, giving an initial reaction of about pH 4.0. However, it was not controlled in sterilized soils of the same pH in the absence of *Trichoderma* spp., indicating that control by acidification of nonsterile soil is not entirely explainable on the basis of the unsuitability of such a medium to *Rhizoctonia*. Evidence is given as indicating that the decisive factor lies in a change of the soil microflora favoring such forms as *Trichoderma*, which may be antagonistic or parasitic for *R. solani*. In moderately acidified, natural soils, abundant inoculation with *Trichoderma* was sometimes accompanied by a larger proportion of healthy seedlings, but such biological control was absent in neutral soils.

Growth at constant temperatures of from 18° to 35° C. apparently affected neither the severity of damping-off nor the degree of control by aluminum sulfate.

Peat moss added to the seedbed proved unsatisfactory commercially, because of its stunting effects. Aluminum sulfate gives promise as a practical control method.

Observations on mycorrhizal infection in the genus Cassia (Caesalpinaceae) [trans. title], H. R. A. MULLER and T. FRÉMONT (*Ann. Agron. [Paris], n. ser., 5 (1935), No. 5, pp. 678–690, figs. 9*).—In this cytological and histological study 12 species of *Cassia* were examined Following a general discussion of the mycorrhizal infections, the pseudoparenchymatous tissues formed by the fungi and their degeneration through swelling and vacuolization are described.

Heart rot of balsam fir in the Lake States, with special reference to forest management, F. KAUFERT (*Minnesota Sta. Tech. Bul. 110 (1935), pp. 27, figs. 10*).—*Abies balsamea*, one of the most widely distributed and aggressive conifers in the Lake States, is reported to be reproducing well, particularly under aspen stands protected from fire. The rapidly decreasing supply of spruce has focused attention on this species for pulpwood, and an increasing consumption is indicated for the future. Much of the prejudice against balsam fir for pulpwood is said to be due to the large amount of rot in present merchantable stands. Practically all of the cull losses are due to heart rot.

This study, based on over 1,100 trees cut from 19 sample plats in northern Minnesota and Wisconsin, indicates the present disease condition of the stands and furnishes information for determining the decay and cull losses and the probable pathologic rotation.

Since the percentage of cull and rot increases rapidly after 70 yr., it is advised that many of the overmature stands be logged in the near future to avoid additional losses from rot and wind breakage. The pathologic rotation is set at 80 yr. The diameter limit in the present stands at which decay becomes important is about 8 or 9 in., the age of such trees being about 80 yr. These data indicate that trees of pulpwood or merchantable size may be grown in from 60 to 70 yr. in stands under management, and that by shortening the rotation cull and decay losses can be reduced to a minimum. The incidence of rot was higher in fast-growing than in slow-growing trees of the same age, and that of butt rot in trees from ridges than in those from swamps. The latter may be related to the greater wind breakage on the higher land.

Over 90 percent of the butt rot was of a yellow, stringy type, due principally to *Poria subacida*, and the rest was a brown, cubical rot due largely to *Polyporus balsameus*. Almost all of the top rot was a red rot due to *Stereum sanguinolentum*. Although lower in incidence than butt rot, top rot causes as much cull because it affects more of the merchantable volume of the trees.

Butt rot occurred in rather young trees, and 50 percent of the 60-year-old trees had some rot at stump height. Top rot did not occur in many trees until they were from 80 to 90 yr. old. Wounds were common only on overmature trees, frost cracks being the most frequent type. No reliable external signs were found for distinguishing young trees with decay. The fungi of butt rot usually enter through broken side or taproots, the fungus of top rot through branch stubs.

A cultural study of the fungi showed that field identifications were accurate for the yellow stringy and red rots, but the presence of several fungi rendered it difficult for the brown, cubical rot. A blue stain fungus was rather prevalent in the interior of overmature trees.

Decay following fire in young Mississippi Delta hardwoods, G. H. HEPTING (*U. S. Dept. Agr., Tech. Bul. 494 (1935), pp. 32, pls. 4, figs. 6*).—During the summer and fall of 1932, 602 fire-scarred trees of 9 Delta hardwood species were dissected and analyzed for decay and insect injuries. These trees were from 3 to 11 in. in diameter and were from 4 parishes in Louisiana and 3 counties in Mississippi.

The fire scars were found to have healed most rapidly in the oaks and red gum, followed by ash, hackberry, and persimmon. The greater the number

of years since scarring, the greater was the proportion of scarred trees showing decay. Of the species studied, hackberry proved most susceptible to initial infection, followed by oaks, ash, red gum, and persimmon. In red gum and persimmon, wound gum was produced just under the scarred surfaces. This protected the trees against infection, but much of this effect was lost if subsequent fires killed the exposed sapwood. Decay spread upward from the fire scar most rapidly in the oaks, followed in order by ash, red gum, hackberry, and persimmon.

A definite relation occurred between the rate of decay and the age of the tree, percentage of the tree circumference scarred, diameter at the time of scarring, diameter at the time of observation, and the fungus causing the decay. The breaking over of young trees at the base caused by decay following fire scarring was of infrequent occurrence and confined chiefly to overtopped trees and others in poor vigor.

A large number of fungi of several hymenomycetous families were found to cause decay behind fire scars. Many of them, including *Lentinus tigrinus* and *Polyporus lucidus*, could induce rot in dead sapwood and in old sapwood and heartwood of living trees, but a single fungus was responsible for the major decay in any one tree.

A large variety of insects, chief among which were ants and termites, were found to invade the decayed wood behind fire scars, but only one species (*Parandra brunnea*) invaded the sound wood beyond the decayed area for any distance. Insects apparently played a minor role in the ultimate damage.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Studies on some of the small mammals of central New York, M. T. TOWNSEND (*Roosevelt Wild Life Ann. [Syracuse Univ.], 4 (1935), No. 1, pp. 120, figs. 34*).—In the introductory part of this contribution (pp. 8–58) trap line studies on small mammals in central New York are reported. The second part (pp. 59–104) consists of notes on the biology of certain small mammals, particularly the short-tailed shrew (*Blarina brevicauda brevicauda* (Say)). A list of the plant species occurring in the central section of New York in which the studies were conducted by habitats (pp. 104–110), prepared by J. Pearce and C. P. Brown, and a bibliography of 10 pages are included.

On the causes of the fluctuations in numbers of mouse-like rodents, N. I. KALABUKHOV (KALABUCHOW) (*Zool. Zhur. (Rev. Zool. Russe), 14 (1935), No. 2, pp. 209–242, figs. 6; Eng. abs., pp. 241, 242*).—The author gives a review of the present knowledge, with a list of 68 references to the literature, of the ecology of mice and voles, especially their breeding, mortality, and migration, both under experimental and natural conditions.

Rodents and moles as pests in bulb plantings, T. H. SCHEFFER and F. E. GARLOUGH (*U. S. Dept. Agr. Circ. 381 (1936), pp. 16, figs. 9*).—Investigations in the control of rodent pests that affect the bulb industry, conducted on the Pacific Coast from Bellingham, Wash., to San Diego, Calif., are summarized in practical form. The findings and recommendations are said to apply almost equally well to any section of the country. The importance of starting to free the lands of injurious mammals at least the year before the bulbs are to be planted and earlier if possible is emphasized.

"The palatability of the bulbs more commonly grown has been tested in the laboratory both by human taste and by repeated experiments with the smaller rodents in captivity. Not only have the likes and dislikes of the animals experimented with corresponded closely with those of the human palate, but later investigations in the field have borne out the conclusions reached in the labora-

tory. In general, bulbs of tulips, Dutch and Spanish irises, and crocuses (corms) are found to be readily acceptable both to rodents and to the introduced ring-necked pheasant. Hyacinth, freesia, lily, and grape hyacinth (*Muscari*) bulbs are perhaps less relished by rodents but are often more seriously damaged locally, and only narcissus seems to be practically immune to their attack. The corms of gladiolus apparently are not sought after by most rodents, but sometimes the smaller-sized planting stock is stored by pocket gophers in considerable quantity. These corms have a bitter, pungent taste but are not more unpalatable to man than are the roots of certain wild plants to be found in the pocket gopher's stores. Bulbs of ixia, sparaxis, and scilla, which are not so extensively grown, may be classed with those of indifferent but not unpleasant flavor."

The chief smaller mammals the activities of which interfere with bulb growing in the Pacific Coast States are moles, mice, rats, pocket gophers, and rabbits. The several classes of bulbs and pest relations are considered, followed by an account of preventive and control measures.

A study of the nesting habits of the ring-necked pheasant in northwest Iowa, F. N. HAMERSTROM, JR. (*Iowa State Col. Jour. Sci., 10 (1936), No. 2, pp. 173–203, pls. 2, figs. 4*).—In studies by the Iowa Experiment Station 503 pheasant (*Phasianus colchicus torquatus* Gmel.) nests were discovered by direct search and through reports of local cooperators, both in undisturbed cover and after the removal of concealment by mowing and burning.

"Nests were found to be placed on the ground, generally in a slight natural or scooped out depression but occasionally raised a few inches above the surface, and lined with whatever materials were at the spot. Construction of a roof did not appear to be a regular part of the nest building operations, but nests were often placed in such a manner as to take advantage of the partial or complete protection from above offered by nesting cover. On the other hand, nests completely exposed above were observed in 30.2 percent of all cases. In the placing of nests, no particular direction appeared to be favored for exposure or nest openings, and no relation to the distance to trees or water was noted. Drainage of nests varied from excellent to poor, and averaged good. Variation from season to season was observed.

"In the case of nests in large blocks of relatively homogeneous cover a preference for the edge zone, rather than a uniform scattering, seemed to be shown. It is suggested that this edge zone may be proportional to the depth of the block rather than consisting of a strip, the same for any area, of absolute depth.

"The average sizes of completed clutches were: 1933, 12.3 eggs, range 8 to 17; 1934, 10.1 eggs, range 4 to 20; 1935, 12.4 eggs, range 8 to 26. Average for the three seasons: 11.2, range 4 to 26 eggs. A decline in the number of eggs per clutch with the advance of the nesting season was observed. Nests in which more than one pheasant had laid eggs, and single eggs, not in nests, which had been laid carelessly or at random were encountered.

"Fertility varied but little between the three seasons, and averaged 93.1 percent. Viability showed greater variation: 1.5 percent of embryos died in the shell in 1933, 12.2 percent in 1934, and 14.0 percent in 1935. Of the 65 clutches for which the data are complete, 58.4 percent were made up entirely of fertile eggs, but only 36.9 percent hatched every egg. Most clutches contained one to several chicks which died in the shell. As the season of 1934 was unusually dry, and that of 1935 wetter than the average for this region, these losses may not represent the normal condition. More data from normal years are needed before coming to definite conclusions.

"Types and important constituents of nesting cover have been described, and relative success of nesting attempts in each type recorded. The percentage of successful attempts was observed to be low in all cover types for which the data are considered sufficiently extensive.

"The nesting season was found to extend from early April through early September, but the majority of clutches were begun in the period from late April through early June. While the nesting curve for 1935 has a single peak, occurring in the period from May 21 to 30, that of 1934 has two peaks, with a distinct drop between. In view of the lack of data from normal years, it can only be suggested that the 1934 trough was the result of the drought of that season.

"On the basis of 445 nests under regular observation, 76.9 percent were unsuccessful. Causes of failure were apportioned thus: Man, 52.3 percent of all failures; predators, 19.3 percent; abandonment of unsatisfactory sites, dump nests, and infertile clutches, 3.5 percent; flooding, 5.8 percent; nests totally lacking in cover, 0.9 percent; unexplained, 18.1 percent."

A list is given of 14 references to the literature.

The birds of Barbuda, with notes on their economic importance, and relationship to the Puerto Rican avifauna, S. T. DANFORTH (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 19 (1935), No. 4, pp. 473–482*).—This is a contribution to the ornithology of Barbuda, a low coral island of 62 sq. miles surrounded by dangerous reefs, situated 25 miles due north of Antigua in the northern part of the Lesser Antilles. In addition to the 47 species of birds positively recorded from the island, 7 species are definitely recorded for the first time, including 2 which had previously been listed questionably, making a total of 54 species known to occur in Barbuda. Information on these forms is presented in an annotated list.

Bird records from the Virgin Islands, S. T. DANFORTH (*Jour. Dept. Agr. Porto Rico, 14 (1930), No. 3, pp. 107–134, fig. 1*).—The results of observations and collections made of 56 forms in the course of several short excursions to certain of the British and American Virgin Islands are reported.

Birds of St. Croix, H. A. BEATTY (*Jour. Dept. Agr. Porto Rico, 14 (1930), No. 3, pp. 135–150*).—An annotated list is given of 88 forms observed during the course of years of study in St. Croix, Virgin Islands.

Supplementary account of the birds of the Virgin Islands, including Culebra and adjacent islets pertaining to Puerto Rico, with notes on their food habits, S. T. DANFORTH (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 19 (1935), No. 4, pp. 439–472*).—This contribution, intended as a supplement to the author's Bird Records from the Virgin Islands, above noted, includes brief descriptions of islands not previously visited, remarks on the avifauna, an annotated list of the birds observed, and a list of birds, 132 in number, known to occur in the Virgin Islands, including Vieques, Culebra, and adjacent islands.

Investigations concerning Cuban birds, with special reference to their economic status, and consideration of those which might be desirable for introduction into Puerto Rico, S. T. DANFORTH (*Jour. Agr Univ. Puerto Rico [Col. Sta.], 19 (1935), No. 4, pp. 421–437*).—The information here presented in an annotated list of 67 forms of Cuban birds was obtained during the course of two short visits to Cuba in the summers of 1933 and 1934. An examination of the stomach contents of 11 species of birds collected during the visit to Guane, at which time the region was experiencing a severe infestation of cutworms, has shown that cutworms formed from 6.3 to 90.5 percent of the total food.

The contribution concludes with remarks on the desirability of introducing certain Cuban birds into Puerto Rico.

A new ground dove from the West Indies, S. T. DANFORTH (*Jour. Agr. Univ. Puerto Rico* [*Col. Sta.*], *19* (*1935*), *No. 4, pp. 483, 484*).—Specimens of ground doves from St. Thomas and the British Virgin Islands which differ in the color of their bills from *Columbigallina passerina portoricensis* (Lowe) of Puerto Rico and the Virgin Islands are described as representing a new form under the name *C. passerina nigrirostris.*

The Puerto Rican form of the broad-winged hawk, S. T. DANFORTH and J. A. SMYTH (*Jour. Agr. Univ. Puerto Rico* [*Col. Sta.*], *19* (*1935*), *No. 4, pp. 485, 486*).—The capture of a broad-winged hawk for the first time in Puerto Rico led to the recognition of a new form under the name *Buteo platypterus brunnescens.*

Biology, distribution, and economies of the rose-coloured starling (Pastor roseus L.) in middle Asia, R. N. MEKLENBURTSEV (*Trudy Sred. Aziatsk. Gosud. Univ., Zool.* (*Acta Univ. Asiae Med., Zool.*), *ser. 8-a, No. 16* (*1935*), *pp. 22, fig. 1; Eng. abs., p. 22*).—An account is given of a starling occurring in middle Asia, a single colony of which may destroy 100 tons of grasshoppers during a single season.

Studies on the cytoplasmic components in fertilization.—I, Ascaris suilla, V. COLLIER, JR. (*Quart. Jour. Micros. Sci.* [*London*], *n. ser., 78* (*1936*), *No. 311, pp. 397–418, figs. 9*).—This report of studies is presented with a six-page bibliography.

[Contributions on entomological technic] (*U. S. Dept. Agr., Bur. Ent., 1934, ET–1, pp. 3, pls. 2; ET–2, p.* [*1*], *pls. 2; ET–3, p.* [*1*], *fig. 1; ET–4, pp.* [*2*], *pl. 1; ET–5, p.* [*1*]; *ET–6, pp. 2, pls. 2; ET–7, p.* [*1*], *pl. 1; ET–8, p.* [*1*], *pl. 1; ET–9, pp. 5, pls. 2; ET–10, pp. 2, pl. 1; ET–11, pp. 4; ET–12, p.* [*1*], *pl. 1; ET–13, pp.* [*2*], *pls. 2; ET–14, p.* [*1*], *pls. 2; ET–15, pp. 3, pls. 2; ET–16, p.* [*1*], *pl. 1; ET–17, p.* [*1*], *pls. 2; ET–18, p.* [*1*], *pl. 1; Bur. Ent. and Plant Quar., ET–19, pp. 3, pls. 3; ET–20, p.* [*1*]; *ET–21, pp. 3, pl. 1; ET–22, p.* [*1*]; *ET–23, p.* [*1*]; *ET–24, pp.* [*2*], *pl. 1; ET–25, p.* [*1*], *pl. 1; ET–26, p.* [*1*]: *ET–27, p.* [*1*], *pl. 1; ET–28, pp. 2, pl. 1; ET–29, pp.* [*2*], *pl. 1; ET–30, pp. 2, pl. 1; ET–31, p.* [*1*], *pl. 1; ET–32, pp. 2, pl. 1; ET–33, pp. 2, pl. 1; ET–34, p.* [*1*]; *ET–35, p.* [*1*], *pl. 1; 1935, ET–36, pp. 2, pls. 2; ET–37, pp. 2, pls. 2; ET–38, pp. 3, pl. 1; ET–39, p.* [*1*], *pls. 2; ET–40, p.* [*1*], *pls. 2; ET–41, p.* [*1*], *pl. 1; ET–42, p.* [*1*], *pl. 1; ET–43, p.* [*1*], *pl. 1; ET–44, p.* [*1*], *pl 1; ET–45, pp. 3, pls. 2; ET–46, pp. 2, pl. 1; ET–47. p.* [*1*], *pl. 1; ET–48, p.* [*1*], *pl. 1; ET–49, pp. 2, pls. 3; ET–50, pp. 2, pls. 3; ET–51, pp. 2, pl. 1; ET–52, p.* [*1*]; *ET–53, p.* [*1*]; *ET–54, p.* [*1*]; *ET–55, p.* [*1*]; *ET–56, p.* [*1*], *pl. 1; ET–57, p.* [*1*], *pls. 2; ET–58, p.* [*1*], *pl. 1; ET–59, pp. 2, pls. 2; ET–60, p.* [*1*], *pls. 2; ET–61, p.* [*1*]; *ET–62, p.* [*1*], *pls. 2; ET–63, p.* [*1*], *pls. 2; ET–64, pp. 5, pls. 3; ET–65, p.* [*1*], *pls. 2; ET–66, p.* [*1*], *pls. 2; ET–67, p.* [*1*], *pl. 1; ET–68, pp. 2, pl. 1; ET–69, p.* [*1*], *pls. 2; 1936, ET–70, pp. 2, pl. 1; ET–71, pp. 2, pls. 2; ET–72, pp. 3, pls. 3*).—This series of contributions on entomological technic includes the following: Nos. 1, A Treadle Sifter for Examination of Soil in Studies of Insects, by H. C. Donohoe; 2, A Frame for a Life-History Chart, by E. W. Dunnam: 3, A Method for Counting Grasshopper Nymphs, by F. A. Morton; 4, Plaster of Paris and Molding Plaster in Cage Construction, by E. G. Davis; 5, Marking Insects With Aluminum Paint to Determine Molts, by P. A. Woke; 6, An Inexpensive Constant-Temperature Water Bath, by R. Latta; 7, A Labor-Saving Device for Use in the Summation of Biological Data, and 8, Apparatus for Counting Pea Seeds, both by T. A. Brindley; 9, Shading on a Printing Machine, by J. G. Pratt; 10, Two Devices for Shipping Living Host Larvae and Adult Parasites of the Mexican Bean Beetle by Air Mail, by B. J. Landis; 11, A Rapid Laboratory Method for Testing Kerosene-Base Insecticides Against House Flies, by F. L. Campbell and W. N. Sullivan; 12, A Collecting Tube for Living Insects, by T. H. Jones; 13, A Device for Cutting Soil Samples to Any Desired Thickness, by L. Koblitsky; 14, An Improved

Insect Cage for Use Over Flowerpots, by J. N. Tenhet; 15, A Small Inexpensive Stirrer for Promoting Circulation of Water or Air, by C. W. Getzendaner; 16, A Stand Used in Photographing Objects From Above, by F. W. Poos; 17, An Apparatus for Hot-Weather Collecting, by E. G. Davis; 18, A Rearing Cage for Orthoptera, by C. C. Wilson; 19, Neon Type of Light Applicable to General Laboratory Use, by W. D. Courtney and R. Schopp; 20, A Useful Differential Stain for Insect Internal Organs, by C. E. Woodworth; 21, The Chloropicrin Separator, a Device for Separating Insects From Host Materials, by H. C. Donohoe, D. F. Barnes, and C. K. Fisher; 22, Method of Preventing Wire Cages From Blowing Off of Flowerpots, by T. E. Bronson; 23, Convenient Pockets for Sedan Delivery Truck, by F. E. Carroll; 24, Apparatus Used for Collecting Insects in the Field, by J. E. Dudley, Jr.; 25, Cage for Isolating Pea Aphids on Parts of a Plant, by C. W. Schaefer; 26, Graduated Centrifuge Tube for Measuring Masses of Aphids, and 27, Field Support for Round-Form Distance Thermometers, both by J. E. Dudley, Jr.; 28, A Device for Recording Humidity in Among Leaves of Plants, and 29, Cylinder and Piston for Expressing Plant or Insect Juices, both by T. E. Bronson; 30, Life-History Cages for Leaf Rollers, by R. H. Nelson; 31, A Foot-Operated Switch for Intermittent Current, by C. F. Doucette; 32, An Apparatus for Cutting Corrugated Paper Strips, by J. K. Holloway; 33, A Rotator Used in Insecticide Studies, by E. R. McGovran; 34, A Laboratory Device for Supplying Liquids to Adult Insects, and 35, A Moth Catcher for Use in Segregating Individuals, both by H. C. Donohoe; 36, A Revolving Screen Trap for Collecting Insects, by G. L. Smith, J. C. Clark, and A. L. Scales; 37, An Apparatus for the Uniform Release of Volatile Chemicals for Use in Chemotropic Studies With Insects, by G. L. Smith; 38, A Stand for the Photographic Reproduction of Printed Pages, by W. Whitcomb, Jr.; 39, A New Type of Bait Trap for Capturing Insects, by H. H. Walkden; 40, Rearing Box for Small Insects, by H. R. Painter; 41, Inexpensive Metal Flats and Cages for Rearing Insects; 42, A Camera Stand for Insect Photography, and 43, An Inexpensive and Easily Built Hotbed Heating Unit, all by E. T. Jones; 44, A Device for the Automatic Spraying of Apples in the Laboratory, by R. F. Sazama and F. H. Lathrop; 45, A Method of Applying Insecticidal Dusts Quantitatively as a Basis for Cage Tests of Insecticides, by J. C. Elmore, R. E. Campbell, and C. S. Guy; 46, A Dehydrator for Maintaining Low Atmospheric Humidities in Small Incubators, by K. D. Arbuthnot; 47, A Humidifier Used in Small Incubators, by L. G. Jones; 48, A New Insect Cage for Use on Flowerpots, by R. L. Wallis; 49, Soil Sifters for Subterranean Insects, by R. E. Campbell and M. W. Stone; 50, The Construction of a Convenient Type of Experimental Plot Cage, by R. Schopp; 51, Methods and Apparatus Developed for Studying Dispersion of Nitidulids, by D. F. Barnes; 52, Segregation Cells for Insect Pupae, by C. K. Fisher and H. C. Donohoe; 53, A Covered Sifter for Separating Insects From Host Material; 54, Parasite-Proof Screen Lids for Collecting and Rearing Jars, and 55, A Four-Compartment Dissection Dish, all by H. C. Donohoe; 56, A Breeding Cage for Parasites [*Microbracon mellitor* Say], by J. W. Folsom; 57, An Improved Cyanide Killing Jar, by W. J. Buckhorn; 58, Mass Rearing Cages [Hessian Fly], by E. J. Udine; 59, Moth [Codling Moth] Catcher for Laboratory Use, by F. H. Lathrop; 60, A Rain-Gauge Support, by M. R. Osburn; 61, A Cage for Rearing Minute Insects, by E. V. Walter; 62, A Device for Regulating the Quantity of Spray, by O. I. Snapp and J. R. Thomson; 63, A Trap for Collecting Insects, by J. U. Gilmore and J. Milam; 64, Laboratory Methods of Rearing Four Species of Lepidopterous Pests of Truck Crops [the Imported Cabbageworm, Diamondback Moth, Southern Armyworm, and the Greenhouse Leaf Tier], by M. C. Swingle; 65, Apparatus for Treating Insects

With Contact Dusts, by F. S. Chamberlin; 66, An Ovipository for Fuller's Rose Beetle; 67, A Combination Brush and Needle for Handling Mites and Certain Insects, and 68, Methods for Conducting Life-History Studies on Tarsonemid Mites, all by F. F. Smith; 69, A Metal and Glass Insect Cage, by C. E. Woodworth; 70, A Mobile Power Soil Sifter, by M. C. Lane and F. H. Shirck; 71, Soil-Washing Apparatus and Methods Used in Counting Wireworm Eggs, by F. H. Shirck; and 72, Methods and Apparatus Used in Identifying Large Numbers of Leafhoppers of the Genus *Empoasca*, by F. W. Poos, N. H. Wheeler, and J. W. Scrivener.

[Contributions on economic insects, insecticides, and insect control] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1935, E–362, pp. 5, pls. 6; E–363, pp. 7, pl. 1; E–364, pp. 17, pls. 3; 1936, E–365, pp. 11; E–366, pp. 4; E–367, pp. 133*).—Continuing the series previously noted (E. S. R., 74, p. 366), Supplementary Control Measures for Reducing Insect Infestation in the Flour Mill, by R. T. Cotton and G. B. Wagner; The Shipping of Package Bees, by W. Whitcomb, Jr.; The Periodical Cicada, by J. A. Hyslop; Experiments With Derris as a Control for the Pea Aphid, by J. E. Dudley, Jr., T. E. Bronson, and F. E. Carroll; Preventing the Distribution of Pine Tip Moths [*Rhyacionia frustrana bushnelli* Busck, *R. frustrana* Comst., European Pine Shoot Moth, and *R. neomexicana* Dyar], by L. G. Baumhofer; and *Lonchocarpus* Species (Barbasco, Cube, Haiari, Nekoe, and Timbo) Used as Insecticides, by R. C. Roark, are presented.

[Report of work in economic entomology and zoology by the Iowa Station] (*Iowa Sta. Rpt. 1935, pp. 102–115, figs. 2*).—The work of the year referred to (E. S. R., 72, pp. 804, 806) includes white grub investigations, by C. J. Drake and E. V. Collins; influence of meteorological factors upon honey production, stock replacement in honeybees, studies of the races of bees, and factors involved in the transmission of nectar into honey by the honeybee, all by O. W. Park; wheat insect pest survey and the biology and control of onion aphids and thrips, both by Drake; effect of inorganic salts on sensitivity to sucrose of the housefly, and bionomics and control of the codling moth, apple maggot, plum curculio, and round-headed apple tree borer, all by C. H. Richardson; ecology of wild ducks, ecology of gallinaceous game birds, and food habits of avian and mammalian predators, all by P. L. Errington; control of sod webworms in turf, by G. C. Decker; a study of injurious grasshoppers and other Orthoptera, and emergency studies of *Cochilomyia americana* Cush. and Patt., armyworms, corn billbugs, the gladiolus thrips, and the corn earworm, both by Drake and Richardson; and bionomics and control of the chinch bug, by Drake, Richardson, Decker, and H. M. Harris.

[Report of work in entomology by the Missouri Station] (*Missouri Sta. Bul. 358 (1935), pp. 60–70, 83, 84, figs. 2*).—The work of the year in economic entomology referred to (E. S. R., 72, p. 501) includes control of the codling moth, by L. Haseman, G. D. Jones, H. Koch, and L. Jenkins; methods of controlling the chinch bug, by Haseman, T. E. Birkett, Jones, and Koch; substitutes for lead arsenate, by Haseman, Jones, Koch, and C. H. Bowen; insecticides used in control of the chinch bug, by Haseman, Jones, and Bowen; insecticides used against termites; periodical recurrence of insect pests as scourges, by Haseman, Koch, and C. Baldwin; preparation of a new insecticide for codling moth, by C. G. Vinson; and field tests of substitutes for lead arsenate, by H. G. Swartwout.

[Report of work in entomology by the New Mexico Station] (*New Mexico Sta. Rpt. 1935, pp. 27–29, 30, 31, 33, 34, 35, 43, 44*).—This work (E. S. R., 73, p. 205) included bait and light trap experiments and insecticide investigations for control of the codling moth; spraying experiments to control the potato

psyllid; the use of sprays and dusts for control of the onion thrips; use of soil insecticides for control of the California prionus; and spray residue on fruit.

[Report of work with economic insects in South Carolina] (*South Carolina Sta. Rpt. 1935, pp. 43–55, 95–100, 148–151, figs. 2*).—Reference is made to the work of the year (E. S. R., 72, p. 807) with the oriental fruit moth, corn insects (including the rice weevil, the southern cornstalk borer, and the corn billbugs), and miscellaneous notes on injurious insects (including the plum curculio, the codling moth, and the b llweevil), all by O. L. Cartwright; cotton insects (including thrips—the tobacco thrips and the flower thrips—the cotton flea hopper, the potato leafhopper and *Graphocephala versuta* Say, and the cotton aphid) and the onion thrips, both by J. G. Watts; methods of wintering bees, by D. Dunavan; the Mexican bean beetle, by F. Sherman and J. N. Todd; the tomato fruitworm, by Sherman; bollweevil and miscellaneous cotton insect investigation (including field plat poison tests in 1934, spring and fall Spanish-moss examination in 1934–35, bollweevil on plants other than cotton, and bollweevil parasites), by F. F. Bondy and C. F. Rainwater (U. S. D. A. Bureau of Entomology and Plant Quarantine); and cabbage and cucurbit insecticide experiments, both by W. J. Reid, Jr., and C. O. Bare (U. S. D. A. Bureau of Entomology and Plant Quarantine).

[Work in economic entomology by the Texas Station] (*Texas Sta. Rpt. 1934, pp. 42–53, 126–128, 170, 226, 227, 237–239*).—The work of the year with economic insects referred to (E. S. R., 71, p. 810) includes that with the sorghum webworm, by H. J. Reinhard; bollweevil hibernation, by Reinhard and S. E. Jones in cooperation with R. W. Moreland and E. W. Dunnam of the U. S. D. A. Bureau of Entomology; cotton flea hopper—infestation and varietal resistance by F. L. Thomas and H. G. Johnston, strip planting and control by F. F. Bibby and J. C. Gaines, migration and population by Gaines, and hibernation by Reinhard; pink bollworm, in cooperation with the U. S. D. A. Bureau of Entomology, by A. J. Chapman, W. L. Owen, et al.; cotton bollworm, in cooperation with the U. S. D. A. Bureau of Entomology—hibernation by R. K. Fletcher, migration by Gaines, and control by Moreland and Fletcher; thrips on cotton (principally the flower thrips), by Thomas, Gaines, and Fletcher; sulfur as an insecticide, by Fletcher, Bibby, Reinhard, Gaines, J. N. Roney, and Thomas; pecan nut casebearer, by S. W. Bilsing; toxicity of devil's shoestring (*Oracea virginiana*), in cooperation with the Texas A. & M. College and the U. S. D. A. Bureau of Plant Industry, by V. A. Little and G. A. Russell; truck crop insect investigations, including plant lice (turnip aphid) and substitutes for arsenicals by Roney and the onion thrips by Jones; other insect investigations, including the seed corn maggot and the plains false wireworm by Jones, two insects rare in the State, namely, *Phthia picta* Drury and *Arrelius albopunctatus* De G., which cause severe injury to tomatoes, by Jones and S. W. Clark, and *Pelamia repanda* Fab. by Jones; apiculture—inspection 1933–34 by Thomas and C. E. Heard, activities of bees, bee production, and relationship of honey plants to insects, all by H. B. Parks, queen breeding by A. H. Alex and Parks, and horsemint for honey and oil production by Parks and G. S. Fraps; insects affecting animals, including goat lice studies and the sheep botfly, conducted in cooperation with the U. S. D. A. Bureau of Entomology at the Sonora Substation, by O. G. Babcock; at the Weslaco Substation fruit and truck crop insect investigations, including control of the citrus rust mite and of scale with sulfur dust, and control of citrus insects including scale insects and the cotton or melon aphid, bean leafhopper, false cabbage aphid, onion thrips on peas and onions, false chinch bug, cabbage looper, diamondback moth, harlequin cabbage bug, cabbage aphid, tomato suck fly, blister beetles, and nematodes.

by Clark; and at the Temple Substation by C. H. Rogers and S. E. Wolff on insect pests of the year.

[Work in economic entomology by the Washington Station] (*Washington Sta. Bul. 325 (1935), pp. 25, 26, 35–38, 65–67*).—The work of the year briefly referred to (E. S. R., 73, p. 72) includes the use of soaps as spreaders of lead arsenate, by K. Groves; oil sprays and nonarsenicals and nonlead arsenicals for codling moth control, both by R. L. Webster and J. Marshall; pea moth, by A. J. Hanson and Webster; and control of orchard spider mites and the effect of fatty acids on arsenical sprays, both by Marshall. Work at the Cranberry-Blueberry Substation included dormant and other sprays for scale insects, fireworm control experiments with pyrethrum and other sprays, and caddisflies all by D. J. Crowley.

[Studies of economic insects in India] (*Indian Forest Rec., n. ser., 1 (1935), Nos. 5, pp.* [2]+*95–104, Eng. abs.; 6, pp.* [2]+*105–138, pl. 1, figs. 2; 7, pp. 139–150, pls. 2; 8, pp.* [2]+*151–168, figs. 3; 9, pp.* [2]+*169–184, figs. 2; 10, pp.* [2]+*185–204*).—The contributions presented (E. S. R., 74, p. 513) are as follows: New Attelabidae from India (Curculionidae, Col.) [trans. title], by E. Voss; On the Biology of the Braconidae (Hymenopt.), by C. F. C. Beeson, and S. N. Chatterjee; Immature Stages of Indian Coleoptera—18, Brenthidae, by J. C. M. Gardner (E. S. R., 74, p. 513); On the Biology of the Ichneumonidae (Hymenoptera) and On the Biology of the Tachinidae (Diptera), both by C. F. C. Beeson and S. N. Chatterjee; and Entomological Investigations on the Spike Disease of Sandal—25, Lepidoptera, by N. C. Chatterjee (E. S. R., 72, p. 359)

In the contribution by E. Voss, 11 new species of leaf-rolling or shoot-girdling weevils of the curculionid subfamilies Attelabinae and Apoderinae are described and one subgenus is erected. Seventy species of Braconidae, 50 species of Ichneumonidae and 41 species of Tachinidae parasitic on forest insects in India are listed by C. F. C. Beeson and S. N. Chatterjee, with notes on their hosts, distribution, and life cycles. It is considered noteworthy that there are several species of European Tachinidae among those that have been reared from hosts in the Indian region. Forty-six species belonging to 20 lepidopterous families collected on the foliage of sandal (*Santalum album*) by the Forest Research Institute survey of the insect fauna of that tree are listed.

[Contributions on economic insects] (*Indian Sci. Cong. Proc. [Calcutta], 22 (1935), pp. 307, 376–378, 379*).—Contributions relating to insects of economic importance presented at the Twenty-second Indian Science Congress (E. S. R., 73, p. 644), held at Calcutta in January 1935, abstracts of which are presented, include the following: Ecological Studies of Pink Bollworm (*Platyedra gossypiella* Saunders), by M. A. Husain, M. H. Khan, and N. Ahmad (p. 307); Chillies Cultivation in the Periyakulam Area of Madura District, With Special Reference to Leaf-Curl Caused by Thrips [*Scirtothrips dorsalis* H.], by T. V. Ramakrishna Ayyar (p. 376); The Cotton Leaf-Roller (*Sylepta derogata* Febr.) in the Punjab, by M. A. Husain (p. 377); A New Disease of Cardamom (*Elettaria cardamomum*) Apparently Due to Insect [Thrips] Damage in S. India, by T. V. Ramakrishna Ayyar and M. S. Kylasam (p. 377) (E. S. R., 74, p. 370); The Sugarcane Top-Borer (*Scirpophaga nivella*) in the Punjab, by M. A. Husain (p. 377); Fruit Flies and Their Economic Importance in S. India, by T. V. Ramakrishna Ayyar (pp. 377, 378); The Economic Status of the Common Black Ant of South India, *Camponotus* (*Tanaemyrmex*) *compressus* Latr., by P. N. Krishna Ayyar (p. 378); Life-History of *Trichogramma*, a Chalcid Parasitic on the Eggs of the Bruchid Beetles, by D. D. Mukerji and M. A. Hakim Bhuya (p. 379); and Common Aphids in Baluchistan and Their Natural Enemies, by A. C. Sen (p. 379).

Insect pests of growing tobacco in Connecticut, D. S. LACROIX (*Connecticut [New Haven] Sta. Bul. 379 (1935), pp. 85–130, figs. 44*).—A practical summary of information is given of the most important insect pests of growing tobacco in Connecticut, the injuries they produce, and known methods of control based upon investigations extending over six consecutive summer seasons.

The important insect pests of the castor oil plant in S. India, with suggestions for their control, T. V. RAMAKRISHNA AYYAR (*Madras Agr. Jour., 23 (1935), No. 12, pp. 479–485, pls. 2*).—The more important insect enemies of the castor-bean in Madras Province are considered, with recommendations as to control.

Factors affecting insect abundance in flour mills, G. B. WAGNER and R. T. COTTON (*Northwest. Miller, 184 (1935), No. 6, pp. 522, 523, figs. 4*).—The fluctuation in flour beetle population as affected by temperature, running time, and various control measures is shown by a graph with composite curves, based upon the examination of representative samples collected from the milling streams of 21 mills at monthly intervals from 1932 to 1935. Charts are given (1) of the insect populations of milling streams of a flour mill in which the only control operation consisted of the biweekly cleaning of the elevator boots, (2) of insect populations of the milling streams of a flour mill in September 1932 and 1934 illustrating the effect of different control operations on insect intensity, and (3) of insect populations of the milling streams of 4 mills using different control measures.

Place of calcium arsenate in the spray program, P. J. CHAPMAN (*Farm Res. [New York State Sta.], 2 (1936), No. 2, pp. 1, 8*).—This account of the value of calcium arsenate as a substitute for lead arsenate in the orchard spray is based upon an intensive study commenced at the station in 1933, certain phases of which, including a new method of analysis developed by Pearce et al., are noted on page 8.

There were found to be distinct and constant differences in the safeness of the brands on the market, some causing the leaves of apple trees to yellow and drop while others caused no visible injury. This led to the classification of the brands as (1) relatively safe, (2) intermediate, and (3) unsafe. The injury was found to be due to the presence in marked form of an excessive amount of initial soluble arsenic and not to its break-down on the leaf.

As regards its efficiency in insect control, calcium arsenate appears to be about the equal of lead arsenate against all groups of pests, with the exception of some larvae of moths and butterflies. This is a serious imperfection, however, as this insect group includes such pests as codling moth, fruit tree leaf roller, cabbage worms, etc. Slight differences in efficiency may not necessarily be objectionable except in cases of severe infestations. While it appears to give good control and has been used in apple orchards in increasing amounts since 1933 in eastern New York, it has not proved sufficiently effective to control the extreme codling moth populations which occur in the western part of the State.

Industrial fumigation against insects, E. A. BACK and R. T. COTTON (*U. S. Dept. Agr. Circ. 369 (1935), pp. 52, figs. 40*).—This circular discusses the various methods of fumigation in common use, such as general or large-scale fumigation of warehouses and manufacturing plants, vault and bin fumigations, and fumigation under vacuum. The fumigants most suitable under different conditions, together with dosages found satisfactory, are given for a limited number of food and other commodities often requiring treatment during storage and transportation or while offered for sale.

A comparison of the rate of metabolic activity in the solitary and migratory phases of Locusta migratoria, C. G. BUTLER and J. M. INNES (*Roy. Soc. [London], Proc., Ser. B, 119 (1936), No. 814, pp. 296–304, figs. 3*).—The authors report upon work the main object of which is to explore possible physiological differences between the solitary and migratory phases of *L. migratoria* in all instars by means of accurate measurement of their oxygen consumption.

They have found both male and female locusts, in the migratory phase, to show a higher rate of metabolism than individuals in the same stages in the solitary phase. "The metabolic rate in the male, in all instars, appears to be higher than that of the female. It is only in individuals in the first instar that no significant difference is revealed between those in the solitary and migratory phases; in all other instars well marked differences obtain.

"It is concluded that differences in respiratory metabolism are present between the sexes and between the various instars in the migratory locust (*L. migratoria*). It was found that the surface area law of [M.] Rubner, which has been applied to warm-blooded animals, also holds good for *Locusta*. The extent to which these conclusions can be applied to other insects needs investigation."

The common black field cricket—a serious pest in South Dakota, H. C. SEVERIN (*South Dakota Sta. Bul. 295 (1935), pp. 51, figs. 20*).—This report on studies of the field cricket, a serious pest of certain field and garden crops and an important household pest in South Dakota, of which a preliminary report has been noted (E. S. R., 55, p. 355), deals with its economic importance and distribution in that State, its systematic status, life history and seasonal cycles, a description of the various stages through which it passes in completing its life cycle, the behavior and habits of the immature and adult crickets, the damage caused, and information regarding its control and repression through natural enemies and the methods worked out by the author during the course of the work.

The most important of its parasites, *Ceratoteleia marlatti* Ashm., destroys from 20 to 50 percent of the cricket eggs each year. The most effective method of destroying crickets in fields or gardens when the crickets are either in their nymphal or adult stages is by poisoning them with a sodium fluosilicate poison bran bait. Dusting with arsenicals or other insecticides is not recommended.

The leaf-curl disease of chillies caused by thrips in the Guntur and Madura tracts, T. V. RAMAKRISHNA AYYAR, M. S. SUBBIAH, and P. S. KRISHNAMURTI (*Madras Agr. Jour., 23 (1935), No. 10, pp. 403–410*).—A summary is given of studies of the biology and control of the chili thrips *Scirtothrips dorsalis* Hood, the feeding of which caused leaf curl disease of chilies, one of the chief commercial crops in the Guntur district in the Northern Circars and in the Periyakulam area in the Madura district. In addition to chilies and peanuts, castor, pomegranate, beans, mango, cotton, *Cassia* sp., and various weeds in this tract provide alternate food for this insect.

The green coconut bug Amblypelta cocophaga China, R. J. A. W. LEVER (*Agr. Gaz. [Brit. Solomon Isl.], 3 (1935), No. 2, pp. 6, 7, figs. 6*).—The parasite *Anastatus awiagasti* Ferr. is recorded as having been reared from eggs of *Amblypelta cocophaga*.

Control of the melon louse by intercropping, S. MARCOVITCH (*Tennessee Sta. Circ. 55 (1935), pp. 4, figs. 3*).—A brief practical account in which the importance of encouraging the convergent ladybeetle, enemy of the melon aphid, by intercropping or strip farming is emphasized.

Orius insidiosus (Say), an important natural enemy of the corn ear worm, G. W. BARBER (*U. S. Dept. Agr., Tech. Bul. 504 (1936), pp. 24, figs. 3*).—

This bulletin reports upon studies of the small anthocorid bug *O. insidiosus*, formerly known as *Triphleps insidiosus*, which was found by the author in work principally at Richmond, Va., during the years 1928–29 to be the most important natural destroyer of earworm eggs. Occurring throughout most of the United States and southern Canada, it is abundant in many sections and is highly beneficial due to its attack upon many injurious insects. It occurs in general on many plants, but its principal habitat is corn, where eggs are deposited for the most part in the fresh, moist silks.

"Adults are most plentiful on corn plants which have young tassels or are in silk, whereas nymphs occur principally during the silking period. Abundance of silk appears to attract great numbers of adults, affording favorable breeding areas—a place for egg laying, a shelter from inclement weather, and food for both adults and nymphs, especially the latter. Animal food is needed for a long life and much reproductive activity. Adults in cages lived for many days, and females deposited eggs over long periods, a few eggs at a time, provided animal food was plentiful. Individuals receiving no animal food lived for brief periods and deposited no eggs. Adults were fed on corn earworm eggs, newly hatched larvae, and partly grown larvae that had been maimed. The egg is very large in proportion to the size of the adult, from 10 to 12 eggs representing the capacity at one time of an average-sized female. Females frequently die with their abdomens packed with fully developed eggs. The nymphs emerge 3 or 4 days after deposition of the eggs, feed at first upon the moist silks, but prefer animal food during later instars. The nymphal stage occupies about 15 days.

"Four generations annually seem possible in central Virginia, though 2 or 3 are probably more common. The shortest possible complete life cycle occupies about 24 days. In central Virginia *O. insidiosus* was the most important insect enemy of the corn earworm, having been found over a period of years to have destroyed an average of 38.47 percent of the earworm eggs deposited on corn plants. The percentage of corn earworm eggs destroyed by *O. insidiosus* varies during different years and during the different seasons of the year, as well as according to the location of the eggs on the plants and the available supply of other suitable animal food."

A list of 50 references to the literature cited is included.

Leaf-eating caterpillar of coffee (Metadrepana andersoni Tams), F. B. NOTLEY (*East African Agr. Jour., 1 (1935), No. 2, pp. 119–126, figs. 12*).—An account of the leaf-eating caterpillar *M. andersoni*, first recorded from Kenya in 1922, and since reported from Uganda, with means of control.

The eastern tent caterpillar, W. E. BRITTON (*Connecticut [New Haven] Sta. Bul. 378 (1935), pp. 61–82, figs. 22*).—A revision of Bulletin 177 (E. S. R., 29, p. 655), rewritten and enlarged.

Lesser vs. greater wax-moth, V. G. MILUM (*Gleanings Bee Cult., 63 (1935), No. 11, pp. 662–666, figs. 3*).—Observations on the occurrence and biology of the wax moth and *Achroia grisella* Fab. are noted.

Hepialus pharus Druce: A moth borer attacking sugar cane in Guatemala, F. X. WILLIAMS (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 39 (1935), No. 4, pp. 292–297, figs. 3*).—In this contribution the author reports upon observations of a lepidopteran which bores in the stems of several species of plants, including sugarcane, made during the course of studies in Guatemala on insect enemies suitable for importation into Hawaii against the Asiatic beetle. Notes are given on the habits of this moth borer, with plates illustrating its several stages and stem injury.

Biology of the primary screw worm fly, Cochliomyia americana, and a comparison of its stages with those of C. macellaria, E. W. LAAKE, E. C.

CUSHING, and H. E. PARISH (*U. S. Dept. Agr., Tech. Bul. 500 (1936), pp. 24, pl. 1, figs. 14*).—Studies of *C. americana* C. & P., now recognized as a distinct species but formerly confused with *C. macellaria* Fab. (E. S. R., 71, p. 226), indicate that in nature it is a primary obligatory parasite—i. e., the larvae begin their development only in the tissues of live animals—and that it initiates the majority of screwworm infestations in warm-blooded animals in the tropical and subtropical regions of the New World. Its normal distribution extends from Argentina to the southern part of the United States and has been found in a few instances in several of the more northern States.

"The activity of the adults of *C. americana* is considerably influenced by seasonal variations in temperature. In the southern part of the United States, the fly begins its attacks late in the spring or early in the summer. As a rule, the first killing frosts in the fall mark the cessation of the fly's activity throughout the winter; during the milder winters, however, temperatures are not low enough to kill the adults. Studies on the duration of the different stages of *C. americana* reveal the following facts: (1) The incubation period of eggs on wounds in animals ranges from 11 to 21.5 hr. under natural conditions; in one instance, in an animal in a laboratory, eggs hatched in 6 hr., and under controlled conditions of temperature and 100 percent relative humidity the incubation period ranged from 9.2 hr. at 99° F. to 13.9 hr. at 84°; no hatching takes place at 59°. (2) The duration of all larval instars in cattle infested in nature ranges from 82 to 239 hr.; in sheep the weighted mean range of this stage was from 103.8 to 174.5 hr. The length of the different instars appears to be influenced by the size of the wound and the number of larvae that infest it. (3) The prepupal stage lasts from 7 to 76 hr. and the pupal stage from about 7 days in the summer to 54 days during the winter. The duration of both these stages is considerably influenced by temperature and moisture. (4) The longevity of adults in captivity is usually short (about 7 to 30 days), but in one instance a female lived 65 days.

"Larvae of *C. americana* appear to penetrate more deeply into soil to pupate than do those of *C. macellaria*. Individual females of *C. americana* may lay as many as 2,853 eggs. The eggs are deposited in characteristic batches of 10 to 393 eggs each, and the oviposition of as many as 300 eggs may be completed in from 4 to 6 min. Eggs of *C. americana* are killed at temperatures near the freezing point, but prepupae, pupae, and adults are able to withstand temperatures considerably below this point. The evidence indicates that under natural conditions *C. americana* breeds only in live animals, but in the laboratory it has been possible to rear it from the egg to the adult stage on dead tissue. The comparative abundance of *C. americana* and *C. macellaria* in nature, as determined by the number of each species attracted to fresh and necrotic wounds, is 1 of the former to 590 of the latter; as determined by the number taken in meat-baited fly traps, the ratio is 1 to 2,427. Under controlled laboratory conditions the length of the life cycle of *C. americana* is about twice that of *C. macellaria*."

Investigations of the life history and control of the spinach leaf miner (Pegomyia hyoscyami Pz.).—Eleventh communication: The life history of the spinach leaf miner [trans. title], H. BLUNCK, H. BREMER, and O. KAUFMANN (*Arb. Biol. Reichsanst. Land u. Forstw., 20 (1933), No. 5, pp. 517–585, figs. 19*).—A report of further studies (E. S. R., 64, p. 853) of the biology of the beet fly (officially known as the spinach leaf miner) in Germany, presented with a two-page list of references to the literature.

Control of the Mexican bean beetle by a new and improved form of cryolite, S. MARCOVITCH and W. W. STANLEY (*Tennessee Sta. Circ. 56 (1936), pp. 4, figs. 4*).—A brief practical account of the value and manner of use of an

improved form of cryolite known as Alorco, which is twice as bulky as other cryolites. It is said to be effective against flea beetles, potato beetles, cabbage-worms, cucumber beetles, blister beetles, and tobacco worms.

Investigations on Anomala orientalis Waterhouse at Oahu Sugar Company, Ltd., F. A. BIANCHI (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 39 (1935), No. 4, pp. 234–255, figs. 4*).—The Asiatic beetle, thought to have been introduced into Hawaii prior to 1908 from Japan, where it is not known as a sugarcane pest, has established itself in Hawaii as one of the most important enemies of sugarcane. Although not yet spread to any other island than Oahu and found there only over a relatively small area of 14,000 or 16,000 acres, its ravages have at times been so serious as to cause the taking of extensive measures to combat it. The introduction of the parasite *Scolia manilae* Ashm. from the Philippine Islands resulted in 1916 and 1917 in the reduction of its injury. There was no further damage to cane until the spring of 1930 when its attack resulted in a considerable drop in the production in two fields.

In the present contribution the author reports upon its life history and habits in the field, including oviposition, movements and distribution of the grubs, food habits of the grubs, broods, and behavior of the adults, and its life history in the laboratory, the details being given in nine tables.

Relation between the physical properties and chemical components of various grades of geraniol and their attractiveness to the Japanese beetle, F. W. METZGER and W. W. MAINES (*U. S. Dept. Agr., Tech. Bul. 501 (1935), pp. 14, fig. 1*).—Geraniol is the principal ingredient for the baits used in traps to capture the Japanese beetle, the baiting of these traps involving the consumption of several thousand pounds of this material annually. Geraniol of a high degree of purity was formerly employed for this purpose, but it has been ascertained that material of high quality is not essential for maximum attractiveness to the beetle. The cheaper grades of geraniol, known as technical or soap geraniol, vary widely in composition, but new specifications for such material have been prepared, and geraniol meeting these standards is more attractive to the Japanese beetle than the more expensive grades. Geraniol that is satisfactory for use in Japanese beetle traps should contain at least 70 percent of free alcohols as geraniol and citronellol, not more than 15 percent of esters as geranyl acetate, and not more than 3.5 percent of aldehydes as citronellal. Material meeting these standards can be obtained in quantity at approximately 60 ct. per pound as compared with a cost of $1.50 per pound for the geraniol used heretofore.

Cotton boll weevil survival and emergence in hibernation cages in Louisiana, R. C. GAINES (*U. S. Dept. Agr., Tech. Bul. 486 (1935), pp. 28, figs. 9*).—The results of a study of hibernation of the boll weevil, conducted at the Tallulah, La., field station from 1915–16 to 1930–31, with the exception of the winter of 1926–27, are reported. Many factors are found to influence the percentage of survival, which was highest among weevils placed in cages during the latter half of October and the first half of November. There was no survival among weevils put into the cages prior to September 7.

It was found that the period of emergence normally extends into June, sometimes into early July. Wet weather during October and November tends to insure a larger emergence the following spring. A killing frost 1 or 2 weeks earlier than usual may greatly reduce survival; a delay of the first frost may increase it. In a study of the relation of winter weather conditions to weevil survival it was found that the only significant correlations were between minimum temperatures and survival. Temperatures of 20° F., or lower, are accompanied by the lowest survival. As hibernation shelter, cornstalks were

most favorable, with Spanish-moss ranking second An average survival of 1.22 percent was recorded in all hibernation cages. The final field population of weevils by the close of the growing season depends more upon the weather than upon the initial infestation.

[Report of work in apiculture by the Wyoming Station] (*Wyoming Sta. Rpt. 1935, pp. 18–20*).—The work of the year in apiculture referred to (E. S. R., 72, p. 655) includes that with package bees, a method of wintering bees, and the results of cooperative work conducted at the U. S. Department of Agriculture Intermountain Bee Culture Field Station on effect of size of colony and pollen reserves on honey production and American foulbrood.

Septicaemia of bees and its causative agent, A. BOIKO (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 3 (1935), No. 3, pp. 141–144*).—An account is given of a disease that broke out among apiaries in the southern regions of the Ukraine in the summer of 1934, to the cause of which the name *Proteus apisepticus* is given. "The bee colonies stricken with this epizootic were so weakened that they could not gather sufficient supplies of honey for the winter. Many colonies perished completely, having lost all their adult population. This epizootic disease in most cases showed a wavelike curve, dying down for a time and then breaking out again with renewed force and carrying away each time about 20 percent of the adult population of the diseased bee colony. The clinic symptoms of the diseased bee consisted in a loss of their flying powers and a rapid onset of death without any intestinal disorders."

Biology of Pareumenes quadrispinosus Sauss. (Hymenoptera, Vespidae) and its parasites, particularly Calosota sinensis Ferr. [trans. title], R. P. O. PIEL (*Mus. Heude [Univ. Aurore, Shanghai], Notes Ent. Chin., 2 (1935), No. 6, pp. 105–139, pls. 4, figs. 4*).—Observations of the biology of this wasp, and particularly of its provisioning of the nest, are followed by an account of its parasites and commensals.

New equipment for obtaining host material for the mass production of Trichogramma minutum, an egg parasite of various insect pests, H. SPENCER, L. BROWN, and A. M. PHILLIPS (*U. S. Dept. Agr. Circ. 376 (1935), pp. 18, figs. 10*).—In the course of studies of the Angoumois grain moth as a host in the production of the egg parasite *T. minutum*, a new and improved cabinet for rearing this host was designed and patented which utilizes narrow, vertical, hanging trays of wheat and is fitted with automatic collecting devices. A device for treating grain with hot water for elimination of undesirable insects and mites and conditioning of the grain for starting rearing cabinets is described. An infestation of the straw itch mite in rearing cabinets was eliminated by the use of a metal fumigation box, featuring portability, gas-tight construction, and a traylike door sealed with a water layer during operation.

In 1933, 16 cabinets using 24 bu. of wheat yielded more than 125,000,000 *Sitotroga* eggs. In 1933 a peak production of more than 800,000 eggs per day was reached and held constant for a 3-mo. period. In 1934 a similar peak was reached, and production was being continued at a high level at the end of the year.

Ixodoidea of Argentina [trans. title], R. L. DIOS and R. KNOPOFF (*Rev. Inst. Bact. [Argentina], 6 (1934), Nos. 3, pp. 359–412, pls. 8, figs. 9; 4, pls. 9*).—Brief accounts of 14 ticks occurring in Argentina are accompanied by colored plates illustrating the Gulf coast tick, *Amblyomma dissimile* Koch, *A. rotundatum* Koch, *A. furcula* Dönitz, *A. altiplanum* Dios, *A. cajennense* Fab., *A. testudinis* (Conil), *A. ovale* Koch, *Ornithodoros talaje* (Guérin Méneville), and the ear tick.

ANIMAL PRODUCTION

Livestock for small farms, R. ERSKINE (*U. S. Dept. Agr., Farmers' Bul. 1753 (1936), pp. II+33, figs. 10*).—Information is presented on the housing, feeding, and management of chickens, ducks and geese, turkeys, squabs, pigs, rabbits, dairy cows, and milk goats, intended for families on small farms of from 1 to 5 acres.

[Livestock investigations in Iowa] (*Iowa Sta. Rpt. 1935, pp. 44, 48, 49–56, 59–63, 64, figs. 2*).—Data obtained in tests with beef cattle are reported on the value of whole soybeans for fattening calves, by C. C. Culbertson; and the influence of feeding coconut oil and menhaden oil upon the quality and palatability of beef, by M. D. Helser, Culbertson, B. H. Thomas, and P. M. Nelson.

Swine studies yielded information on consequences of inbreeding Poland-China hogs, by J. L. Lush and Culbertson; influence of breeding on the important characteristics of swine, by Lush, Culbertson, Helser, and F. J. Beard; the influence of soybeans and soybean oil meal upon the character and quality of fat and lard from swine, by Culbertson, Helser, Beard, and Thomas; and growth, gains, and ability to utilize feed and carcass quality of litters from different sows, by Culbertson, Thomas, Helser, and Lush.

Tests with colts yielded information on chopped v. uncut hay for draft colts, and factors involved in the production of colts, both by A. B. Caine.

Nutrition investigations yielded data on the nature of the floridin activation of cholesterol, by L. Yoder; and effects of the ingestion of fluorides on some of the constituents of the bones of albino rats, by J. A. Schulz.

Poultry studies gave results on the effect of diet on the quantity of vitamins A and D occurring in hens' eggs, by Thomas; biological value of meat scrap and dried skim milk for egg production, by E. W. Henderson; the association of early sexual maturity with egg production, by N. F. Waters; the influence of selection and breeding upon egg production and maturity, by Waters and Henderson; the effect of inbreeding, line breeding, outbreeding, and cross-breeding, by Waters and W. V. Lambert; and the influence of protein levels and calcium and phosphorus balance upon rachitis of chicks, by H. L. Wilcke and Henderson.

[Investigations with livestock in Missouri] (*Missouri Sta. Bul. 358 (1935), pp. 10–17, 24, 25, 52–54, 88–92, 108*).—Information obtained in experiments with beef cattle are reported on protein supplements for yearling steers full-fed on bluegrass pasture, by E. A. Trowbridge and H. C. Moffett; pasture v. dry lot for full-feeding yearling steers during the summer, by L. A. Weaver and Moffett; wintering stock calves, by Weaver and J. E. Comfort; creep-feeding winter calves, comparative values of legume hays for wintering native calves, grinding grain for fall calves, and molasses-alfalfa supplements to grain rations for calves, all by Trowbridge, Comfort, and M. W. Hazen; and a comparison of systems of bluegrass pastures, by Comfort and E. M. Brown.

Tests with other types of livestock yielded results on pastures for lambs, by Weaver and A. J. Dyer; rations for brood sows, by A. G. Hogan and S. R. Johnson; rations for weanling pigs, by Weaver; and growth in draft colts, by Trowbridge, H. D. Fox, and S. Brody.

In poultry tests, results were obtained on time of hatching in relation to egg production, and the feed purchasing power of eggs laid by a hen, both by H. L. Kempster; effect of various sources of vitamin D on growth of chicks, influence of time of hatch on rate of growth, and rate of growth of Rhode Island Red, White Rock, and White Leghorn pullets, all by Kempster and E. M. Funk; and seasonal variation in hatching, the relation of egg size

and hatchability, the effect of age of egg upon length of incubation period, effect of preincubation on the length of the incubation period, effect of preincubation on hatchability, and the effect of length of the incubation period on mortality, all by Funk.

Nutrition studies yielded data on successful simplified diets for chicks, by Hogan and R. B. Boucher, Jr.; avitaminosis A in swine, by C. Elder; the energy expense of horizontal walking in cattle and horses of different ages and body weights, by Brody, W. C. Hall, and R. C. Proctor; the energy expense of working in horses, by Brody, Proctor, and M. M. Jones; the influence of live weight on the efficiency of egg production in the domestic fowl, by Funk, Brody, and Proctor; the energy expense of pregnancy, by Brody, U. S. Ashworth, and Proctor; and the energy increment of lactation and the ratio between endogenous nitrogen excretion and basal energy metabolism, both by Brody and Ashworth.

[Livestock investigations in New Mexico] (*New Mexico Sta. Rpt. 1935, pp. 23–25, 58–61*).—Experiments with range livestock produced results on the comparative supplemental values of monocalcium phosphate, anhydrous dicalcium phosphate, and finely ground bonemeal when fed to cattle on a deficient calcium and phosphorus range; the determination of whether or not dicalcium phosphate when fed to sheep will decrease the death loss on pingue areas, and of the increase or decrease of pingue on grazed and protected plats; the importance of alfalfa hay in different proportions in replacing hegari fodder for fattening lambs when used with shelled corn and cottonseed meal; and a study of the phosphorus and calcium content of the important livestock grazing forages in different sections of the State.

In poultry tests, results were obtained in a study of some of the characteristics that contribute to high egg production; a study of the influence which different range crops and rations exert upon net returns from the laying flock through their influence on egg quality, number of eggs produced, and flock mortality; and a study of the value of ground chili in the laying ration.

[Livestock investigations in South Carolina] (*South Carolina Sta. Rpt. 1935, pp. 57–59, 64–71, 81–83, fig. 1*).—Studies with beef cattle produced results on methods of feeding cottonseed meal and hulls to fattening steers, by E. G. Godbey and L. V. Starkey; flaxseed husks v. cottonseed hulls in the ration for wintering beef cows, by Starkey; and the effect of phosphorus and calcium on the growth and breeding qualities of beef cattle, by T. M. Clyburn and E. D. Kyzer.

Swine studies yielded information on a comparison of protein supplements for fattening hogs in dry lot, by Godbey and Starkey; digestion trials with swine, by Godbey, Starkey, and J. H. Mitchell; and a comparison of summer forage crops for fattening hogs as to rate and economy of gain and hardness of fat, and a comparison of winter forage crops for fattening hogs as to rate and economy of gains, both by Kyzer and Clyburn.

Results were obtained in tests on breed performance in early spring lamb production, by Starkey.

Poultry tests produced results as to the value of vegetable proteins in laying and breeding rations, force-molting of yearling hens, factors affecting the physical quality of eggs, and chick starting rations, all by C. L. Morgan and D. F. Sowell; and a study of the balance between intake and outgo of nitrogen, sulfur, calcium, and phosphorus in the nutrition of the hen, by Morgan and Mitchell.

[Experiments with livestock in Texas] (*Texas Sta. Rpt. 1934, pp. 16, 30–41, 113–117, 120–122, 140–142, 145, 146, 190, 191, 195, 198, 199, 218, 219, 221, 222*).—Studies with beef cattle yielded results on sumac fodder and silage, cotton-

seed meal, and pulverized oystershell in steer fattening rations, all by J. H. Jones, R. E. Dickson J. M. Jones, and W. H. Black; rations for fattening yearling steers in the Madera Valley, by J. M. Jones, J. J. Bayles, J. H. Jones, and Black; the preparation of milo grain for fattening baby beeves, by J. M. Jones, F. E. Keating, J. H. Jones, and Black; cottonseed in cattle fattening rations and rice bran as part of the grain ration in cattle fattening, both by J. H. Knox and J. M. and J. H. Jones; Sudan grazing v. Sudan grazing and cottonseed cake, and mineral requirements of cattle in the Rio Grande plains region, both by J. H. Jones, R. A. Hall, J. M. Jones, and Black; mineral requirements of cattle in the east Texas region, by J. H. Jones, P. R. Johnson, and J. M. Jones; and steer feeding trials at Beeville, Tyler, Spur, and Balmorhea.

Sheep and goat studies produced results on the following subjects: The relation of age of the animal to fineness of wool and mohair, by J. M. Jones and B. L. Warwick; grades and shrinkages of Texas wool and mohair, by S. P. Davis and J. M. Jones; utilization of Angora kid skins, by Warwick; alfalfa hay v. (1) sumac silage with and without pulverized oystershell, and (2) cottonseed hulls as roughages for fattening lambs, by W. L. Stangel and J. M. Jones; alfalfa hay, chopped sorgo hay, and sorgo silage with and without pulverized limestone in lamb fattening rations, and cottonseed in lamb fattening rations, both by A. K. Mackey and J. M. and J. H. Jones; a study of the adaptation of the Corriedale sheep to southwest Texas conditions, by J. M. Jones, W. H. Dameron, Warwick, and D. A. Spencer; relation of skin folds to weight of fleece on Rambouillet sheep, by J. M. Jones, Warwick, Dameron, and Davis; and crutching or tagging bred Rambouillet ewes, by Dameron, J. M. Jones, and Davis.

With swine, results were obtained in experiments on the effect of rations deficient in vitamin A on embryonic eye development in pigs, self-feeding brood sows throughout the gestation and lactation periods, calcium requirements of growing and fattening pigs when fed grain rations balanced with cottonseed meal, the average daily gains and feed required per 100 lb. of gain by pigs fed in periods of wide climatic differences, the value of oats pasture for fattening hogs, and the utility of rice and rice byproducts in rations for growing and fattening swine, all by F. Hale; fattening hogs on west Texas feeds, by Hale and D. L. Jones; and curing and storing pork in west Texas, by Hale, R. W. Snyder, and D. L. Jones.

The poultry studies yielded information on the productive value of feeds, by G. S. Fraps; vitamin A requirements for chickens, and effect of feed on leg disorders in chicks, both by R. M. Sherwood and Fraps; lime and phosphoric acid requirements for chicks, by Sherwood and J. R. Couch; and effect of feeds on storage quality of eggs, by Sherwood.

Nutrition studies produced data on the yields and feeding value of spineless cactus (*Opuntia ellisiana*), by Dameron and O. L. Carpenter.

[Livestock investigations in Washington] (*Washington Sta. Bul. 325 (1935), pp. 23, 24, 25, 54, 55, 64, 65*).—Data were obtained in studies on comparing rations of cull potatoes, corn, and corn and wheat for lambs, by H. P. Singleton; the nutritive value of bluebunch fescue and bluebunch wheatgrass, by R. McCall; the nutritive values of Albit wheat and other cereal hays, by J. Sotola and McCall; the frequency of feeding lambs en route to market, by H. Hackedorn; and the value of potatoes with corn and alfalfa for fattening lambs, by Hackedorn and Singleton.

In poultry investigations, results were reported on the chemical nature of watery white in eggs, by J. L. St. John; and a comparison of different amounts and sources of protein for laying hens, comparisons of different amounts of vitamin G for growing chicks, and the utilization by poultry of salmon byproducts

from different sources and manufactured by different methods, all by V. Heiman and J. S. Carver.

[Livestock investigations in Wyoming] (*Wyoming Sta. Rpt. 1935, pp. 12–15, 17, 24, 28, 29, 30, 31, 35, 36, 37*).—Tests with beef cattle produced results on mineral supplements for beef cows, wet beet pulp rations for fattening steers at the Torrington Substation, and beet pulp rations for steers at the Worland Substation.

With sheep, tests produced results on crossbreeding fine wool ewes, improving Rambouillet fleeces by crossing with Australian Merinos, feeding lambs in cornfields at the Archer Substation, feeding ewe lambs at the Eden Substation, pasturing lambs on beet tops at the Torrington Substation, and beet tops and beet pulp in lamb rations at the Worland Substation.

Poultry studies yielded information on the value of a straw-loft poultry house, rye in the laying rations, and roost dents in the breast bones of turkeys.

Other studies produced information on the place of yucca, pondweed, and Russian-thistles as forage crops, including analyses, and economical rations for fattening hogs at the Gillette Substation.

The normal distribution of calcium between the skeleton and soft tissues, O. A. Bessey, C. G. King, E. J. Quinn, and H. C. Sherman (*Jour. Biol. Chem., 111 (1935), No. 1, pp. 115–118*).—This study was undertaken to determine the distribution of body calcium between the skeletal system (including the teeth) and the soft tissues (including the blood and lymph), using the rat as a representative mammal.

The percentage of the total body calcium found in the skeletal system of 34 adult male rats averaged 99.33 with a probable error of 0.018, and in 31 adult females 99.32 with a probable error of 0.019. In rapidly growing immature rats, while the normal process of calcification was still unfinished and in adult rats of low calcium content due to calcium-poor food, a somewhat smaller percentage of the total protein calcium was found in the skeletal system. Even in these cases, however, the skeletal system contained approximately 99 percent of the total body calcium.

Foetal death, prolonged gestation, and difficult parturition in the rat as a result of vitamin A-deficiency, K. E. Mason (*Amer. Jour. Anat., 57 (1935), No. 2, pp. 303–349, pls. 2, fig. 1*).—These studies were undertaken to investigate the factors involved in fetal resorption and in late fetal death associated with prolonged gestation and disturbance of the birth mechanism in rats on a vitamin A-deficient ration. Attempts were made to ascertain the manner in which lack of vitamin A induced these abnormalities.

It was found that levels of vitamin A deficiency approximating or exceeding that necessary to induce abnormal vaginal cornification, but insufficient to produce xerophthalmia, resulted in marked disturbances in the reproductive function of the female. Resorption of all or a variable proportion of the fetal sites frequently occurred during early pregnancy under such conditions. Localized areas of infection, leucocytic infiltration, and cellular necrosis, originating around remains of undestroyed uterine epithelium, were observed at the junction of the ectoplacenta and the maternal decidua. Early death of the fetus was attributed to disturbance of the nutritive supply resulting from the placental injury. The resorptive process of A deficiency could readily be distinguished from that typical of E deficiency, even when both were present in the same fetal site. With A deficiency, fetal death was secondary to marked placental injury, while E deficiency primarily affected the fetal tissue. When all or a portion of the fetal sites failed to undergo fetal resorption, growth of the fetus was often retarded and fetal death occurred at different times dur-

ing late pregnancy. Death of the fetus at this stage was attributed to a less acute manifestation of the same factors responsible for the earlier resorption.

Death to any or all of the fetuses during late pregnancy usually prolonged gestation and resulted in a marked disturbance of the birth mechanism. Prolonged gestation and difficult parturition were often associated with excessive uterine bleeding, variations in size of placenta, and with infection, hemorrhage, and tissue necrosis in the placenta and uterine wall. Except for the resorptive process, the reproductive disturbances were usually reparable and could often be prevented by the institution of A therapy as late as the last third of pregnancy. It was not demonstrated that A deficiency caused significant injury of the ova, impaired the mechanism of implantation, or disturbed the endocrine functions of the ovary or anterior hypophysis. The prolonged gestation and difficult parturition were due to the decreased vitality and death of fetuses during late pregnancy and to a decreased tone of the abdominal and uterine muscles.

The average of living young born to mothers on A-deficient diets died within a few days, due to inherent weakness and impaired mammary function of the mother. The abnormalities of reproductive function appeared to be due to alterations induced in the epithelial lining of the female reproductive tract and, indirectly, to infections resulting from epithelial injury.

Selenium in proteins from toxic foodstuffs.—I, Remarks on the occurrence and nature of the selenium present in a number of foodstuffs or their derived products, K. W. FRANKE and E. P. PAINTER (*Cereal Chem., 13 (1936), No. 1, pp. 67–70*).—The South Dakota Experiment Station found that the codeine-sulfate test for selenium was reliable as a negative test. In feeding stuffs, selenium was present in the protein fraction. Little, if any, of the element was present as metallic selenium or in an inorganic salt. When toxic proteins were hydrolyzed, most of the selenium remained in solution in some organic compound or compounds. Some selenium appeared to be in a form readily split by alkalies.

Phosphorus supplements improve sugar-beet by-product rations for cattle, E. J. MAYNARD, J. E. GREAVES, and H. H. SMITH (*Utah Sta. Bul. 265 (1936), pp. 29+[1], figs. 9*).—Two cattle feeding tests were conducted to determine whether phosphorus was the factor producing the beneficial results secured when cottonseed cake or other protein supplements high in P were used to supplement beet byproduct rations for fattening steers, and also to investigate available sources for furnishing a cheap supply of P to fortify beet byproduct rations.

The results showed that when steamed bonemeal, cottonseed cake, or mill run bran were added to a P-deficient ration of wet beet pulp, beet molasses, alfalfa hay, and salt, the characteristic pica was eliminated, the appetite was greatly improved, and there were significant increases in gains in weight and reductions in feed costs per unit of gain. While both mill run bran (0.84 percent P) and cottonseed cake (1.33 percent P) produced satisfactory results, steamed bonemeal (14.48 percent P) proved most efficient for supplying the needed mineral. Ground barley (0.21 percent P) when added to the beet byproduct ration increased gains and decreased feed costs somewhat, but did not satisfactorily remedy the P deficiency of the ration. Significant increases in the P content of the blood plasma of steers in these tests resulted from the use of each of these supplements. In the first experiment the P supplement was responsible for a net saving in feed cost of $9.07 per steer, and in the second experiment $13.37 per steer was saved, while in an extension demonstration an increased net return of $10.35 per head was obtained.

Mineral supplements for fattening steers, G. E. MORTON, H. B. OSLAND, and R. C. TOM (*Colorado Sta. Press Bul. 88 (1936), pp. 12, figs. 2*).—These tests

were undertaken in 1934 and 1935 to determine the value of calcium supplements when fed with beet byproduct rations, to determine the amount of protein supplement necessary to balance a ration of straw and cane fodder, to compare alfalfa hay, cane fodder, and oat straw as roughages in beet byproduct rations, and to compare ground and whole cane fodder. In this work five lots of steers were fed for 161 days and three lots for 151 days on various combinations of ground corn and barley, cottonseed cake, wet beet pulp, alfalfa, oat straw, and refuse lime. In addition two lots of calves were fed for 109 days on cottonseed cake and either whole or cut cane fodder.

Adding a high calcium carbonate limestone to a ration of grain, cottonseed cake, wet beet pulp, and alfalfa hay produced no beneficial results. While substituting oat straw and limestone for alfalfa hay in a beet byproduct ration reduced the rate of gain, it lowered the cost per unit of gain. Either 1.5 or 2 lb. of cottonseed cake was more economical than 1 lb. in a ration of grain, wet pulp, and oat straw. The heavier cake feeding increased the rate of gain and the selling price, decreased the cost of gain, and produced more finish. Cane fodder supplemented with limestone showed a greater feed replacement value than alfalfa in a standard beet byproduct ration. With this substitution the increase of cake from 1 to 2 lb. produced greater gains and more finish and cheapened the gains. The percentage waste when whole cane was fed was not great enough to warrant grinding medium-to-fine stalked cane fodder for cattle.

Due to five cases of blindness which developed during this work, it is recommended that during drought years some alfalfa be used as part of the dry roughage when either cane or straw is fed.

The effect of size and type of ewe on efficiency of production, W. E. HUNT (*Maryland Sta. Bul. 380 (1935), pp. 129–153*).—The data reported in this bulletin are based on results obtained from the experimental flocks of the station and on calculations made from Montana Station Bulletin 242 (E. S. R., 65, p. 554).

The results showed that the production by purebred Hampshire ewes, grade Delaine-Merino ewes, and Dorset × grade Delaine-Merino ewes, when bred to purebred Hampshire, Dorset, and Southdown rams, respectively, increased as the size increased when measured by the weight of lambs at 70 days of age, by the pounds of lamb at this age per ewe, and by the annual wool production per ewe. However, if the measure of productive efficiency was based on the pounds of lamb produced at 70 days of age per 100 lb. of breeding ewes maintained, or the pounds of wool produced per 100 lb. of ewe, the efficiency decreased as the size of ewe increased. The data showed that mutton-type ewes have a higher productive capacity and are more profitable than the fine wool ewes on the basis of production and profits per ewe. On the other hand, if production and margin of value of products over feed costs of both ewes and lambs to 70 days of age are calculated on the basis of 100 lb. of ewe, the production and margin over feed costs are greater for the fine wool and crossbred ewes than for the mutton-type ewes.

The author raises the question as to which type of measurement should be used for reporting productive efficiency.

Some effects of breeding ewe lambs, H. M. BRIGGS (*North Dakota Sta. Bul. 285 (1936), pp. 28, figs. 10*).—In the fall of 1927 a total of 244 range-raised ewe lambs averaging 74 lb. per head were divided into two lots. One-half of one lot was exposed that fall to Hampshire rams and the other half to Southdown rams. A second lot was left open to be bred as yearlings.

Of the group bred as ewe lambs, 81 raised lambs the first year, while 23 conceived but lost their lambs before or shortly after birth, and 18 failed to

conceive. The ewe lambs gained in weight until lambing time faster than the open ewes, but weighed less when their lambs were weaned than the open ewes. The late-bred ewes reached their mature weight at about 21 mo. of age, while the early-bred group required about 10 mo. longer to reach this weight. For the remainder of the 7-yr. trial both groups maintained their weight. Early breeding had no effect on fleece production.

The early-bred ewes raised a 64 percent lamb crop the first year, with the lambs weighing an average of 7.9 lb. at birth, and an average of 68.1 lb. at weaning time. The early-bred ewes gave birth to lighter lambs the first year, but subsequent lamb crops were of normal size. For a period of six lamb crops the early-bred group produced an average of 6.7 lambs and a total average weight of lamb of 496.4 lb. During a period of five lamb crops the late-bred group produced an average of six lambs and a total average weight of lamb of 465.4 lb. At the end of the seventh year, 56.8 percent of the remaining late-bred ewes and only 45.9 percent of the ewes in the early-bred group had sound mouths, and there were twice as many broken mouths in the early-bred group as in the late-bred group. Lambs sired by Hampshire rams weighed more at birth and weaning time than lambs sired by Southdown rams, but there was no significant difference in the gross returns from the two types of lambs. The ewes tended to be least variable in their fall weights at weaning time and most variable in spring weights just prior to lambing.

Crossbreeding investigation in the production of California spring lambs, R. F. MILLER (*California Sta. Bul. 598 (1935), pp. 32, figs. 7*).—Concluding this study (E. S. R., 70, p. 77), it was found that sires of the larger breeds, Hampshire and Suffolk, produced lambs weighing 6 to 8 lb. more at 3.5 to 4 mo. of age than sires of the Shropshire and Southdown breeds. Lambs sired by the Shropshire rams were approximately 2.5 lb. heavier at 4 mo. of age than those sired by Southdown rams. There was practically no difference in the weight of the lambs sired by Southdown, Romney, and Rambouillet rams. The Hampshire and Suffolk crosses averaged approximately 10.5 lb. at birth, while the Shropshire and Southdown crosses averaged 9.5 lb.

In pounds of lamb produced per ewe, lambs sired by Hampshire out of Rambouillet ewes (group 1) averaged 99 lb., while Suffolk crosses from similar ewes averaged 96.5 lb. With Romney-Rambouillet ewes (group 2) the Suffolk crosses averaged 87.6 lb. and the Hampshires 83.5 lb. The Shropshire crosses were somewhat better than the Southdowns in both groups. Rambouillet crosses in group 1 averaged 92.1 lb. and Romney crosses 84.2 lb. In grade of lambs on foot, the Southdown crosses ranked first in both groups, followed in group 1 by Shropshire, Hampshire, Suffolk, Romney, and Rambouillet, and in group 2 by Suffolk, Hampshire, and Shropshire. In grade of carcass the Southdown and Shropshire crosses excelled the larger breeds, which ranged in the following order—Hampshire, Suffolk, Romney, and Rambouillet. The rank in dressing yield was similar to that of carcass grade. The final return per carcass at New York showed the following rankings—Hampshire, Suffolk, Shropshire, Southdown, and Rambouillet, with the same relation in group 2 except that the Southdown surpassed the Shropshire.

Group 1 ewes were superior to group 2 ewes in earliness of breeding. Lambs from group 1 were 21 days older, weighed 9 lb. more at market time, and brought 91 ct. more per carcass than those from group 2. The ewes in group 1 produced an average wool clip of 13.5 lb. per head in the grease as compared with 10.8 lb. for group 2, but on a scoured basis the two groups were practically equal. Group 1 produced 76.1 percent twins and group 2 61.6 percent, based on

the ewes that lambed. Group 1 raised 132.2 percent and group 2 128 5 percent of their lambs based on the total number of ewes in the flock.

The dressing percentage and final selling price per hundredweight of dressed lambs were in favor of those from group 2, although the group 1 lambs yielded the greater financial return The study showed the value of the early breeding quality of Rambouillet ewes, and also indicated that there was not enough market discrimination between weight and quality of carcass to permit choice Southdown lambs to compete favorably with the larger, coarser Hampshire or Suffolk lamb.

Fattening thin native lambs, I, II, W. E. HUNT (*Maryland Sta. Bul. 379 (1935), pp. 45–127, figs. 8*).—The results given in this bulletin are divided into two parts.

I. *Improving the market grade of thin native lambs through feeding.*—In the first trial in this phase of the study low-medium and cull lambs were fed a ration of shelled corn, peanut meal, and clover hay. It required 102, 117, and 138 days to put 22, 29, and 34 lb. of gain, respectively, on three lots of low-medium lambs. These gains raised the average carcass grades of the lambs 1⅔, 2⅓, and 2⅔ grades, respectively. Putting 33 lb. of gain on the cull lambs raised their average carcass grade 2⅔ grades. The spread in prices between common to medium lambs and good to choice lambs over a period of 5 yr. indicated the possibilities of feeders being able profitably to feed thin native lambs over a period of years.

Three lots of lambs were fed in the second trial on rations of shelled corn and clover hay; shelled corn, peanut meal, and clover hay; and shelled corn, menhaden fishmeal, and clover hay. The latter ration produced the most rapid and economical gains, but all of the rations were satisfactory.

In the third trial six lots of lambs were used, one lot of which was slaughtered as feeders. The remaining lots were fed clover hay and in addition the respective lots received shelled corn and cottonseed meal; shelled corn and menhaden fishmeal; no concentrates the first 28 days, and then shelled corn and cottonseed meal; the same as the preceding lot with menhaden fishmeal replacing cottonseed meal; and menhaden fishmeal the first 28 days and then shelled corn and fishmeal. The number of days required for lambs to increase from an average initial weight of 54 lb. to an average final weight of 82 lb. were 98, 98, 133, 119, and 119, respectively. At the start of the feeding period the average grade of all lambs was low common, and at the end of the test lots 1 and 2 averaged low choice in grade, lot 3 averaged high good, and lots 4 and 5 average good.

II. *Carcass and meat studies.*—The carcasses from lambs used in the above trials were used for this study. It was found that dressing percentages increased but slightly as the feeding period progressed from 102 to 138 days. The increase in carcass weight resulting from gains obtained in the first and third trials made a substantial improvement in the quality of the carcasses. Cutting yields showed substantial increases in the weight of the major cuts following the feeding period. More fat was deposited in some cuts than in others, causing the percentage of some cuts to decrease with the increasing finish and quality of the carcasses. The increase in the amount of fat accounted for a little more than one-half of the increase in the weight of the loin and rib, while the increase in fat about equaled the increase in weight of lean in legs, shoulders, and breasts. The total physically separable lean of the carcass increased in weight as the result of fattening, but tended to decrease in percentage as the feeding period progressed. The amount of edible material increased from 70.8 in low-medium feeders to 77.8 percent in the carcasses of

lambs fed 102 days and to 79.3 percent in the carcasses of lambs fed 138 days. The total edible material of cull lambs slaughtered as feeders was 65.2 percent.

Changes in cutting yields of carcasses from lambs in the third trial were similar to those obtained in the first trial. Of the major cuts, the loin showed the largest increase in weight, 117.8 percent. The increase in weight of ribs was 74.2, of shoulder 60.4, and of French trimmed legs 49.5 percent. The increase in carcass weight was 63.1 percent. The lean of the carcass increased 4.6 lb., the fat 8.1 lb., bone 1 lb., and the total edible material 12.7 lb. during a 98-day feeding period. The percentage increase in weight of fat was 186 for the legs, 239 for the shoulder, 379 for the rib, 485 for the loin, 172 for the breast, and 344 for the kidney.

A comparison of the palatability of leg and shoulder roasts showed that on the average the shoulders were more tender and more juicy than the leg roasts. Shoulders and legs scored about equal in desirability of flavor of lean and fat and of aroma. Leg roasts from the lower quality carcasses scored higher in the desirable factors than the shoulders from the same carcasses. The percentage of evaporation loss, of dripping loss, and of total cooking loss was greater for legs than for shoulders. The time required per pound of raw weight to roast the legs was a little less than the time required per pound of shoulders.

Fattening western lambs, A. E. DARLOW (*Oklahoma Sta. Bul. 228 (1935), pp. 11, fig. 1*).—In order to determine the most satisfactory method of feeding lambs and preparing roughages for them, a series of three feeding tests was conducted. Six lots of lambs were fed alfalfa hay and whole yellow corn in each of the trials, as follows (with the exception that lot 5 in test 2 was fed whole hay and corn with the addition of cottonseed meal): Lot 1, ground hay and corn self-fed free choice; lot 2, ground hay and corn mixed and self-fed; lot 3, ground hay and corn hand-fed; lot 4, whole hay and corn hand-fed; lot 5, ground hay and corn mixed and hand-fed; and lot 6, whole hay and corn self-fed free choice. The lambs were fed for 90, 76, and 88 days in the respective tests.

The most rapid and cheapest gains were made in lot 2. There were no death losses in this lot and no lambs were off feed. The lowest and most costly gains were made in lot 6. The extra cost of gain in this lot was partially due to the lambs consuming a greater proportion of corn than did the lambs in the other lots. The results indicated that the free-choice method of feeding was not advisable unless 1 lb. of grain could be purchased as cheaply as 1 lb. of hay. When self-fed free choice lambs on ground hay made cheaper gains than those on whole hay due to the greater consumption of hay in the ground hay lot. A comparison of hand-feeding ground and whole hay showed that slightly cheaper gains were made on the ground hay. The cost of gain in the lot that was hand-fed a mixture of ground hay and corn was the second most expensive. The results indicated that if whole hay is to be used it should be hand-fed, and that if ground hay is to be fed it is more economical to mix it with the concentrates and place in a self feeder rather than to hand-feed or self-feed free choice.

New Jersey poultry rations, C. S. PLATT (*New Jersey Stas. Hints to Poultrymen, 23 (1935), No. 1, pp. 4*).—Rations for baby chicks, growing and laying birds, and breeding stock are suggested, together with information on the amount of feed and when to feed it.

A study of the protein requirements of growing chicks, J. D. MCCONACHIE, W. B. GRAHAM, JR., and H. D. BRANION (*Sci. Agr., 15 (1935), No. 11, pp. 754–764, figs. 11; Fr. abs., p. 764*).—The Ontario Agricultural College undertook a preliminary study to determine the optimum amount of protein required to

grow chicks economically. From 50 to 60 day-old Barred Plymouth Rock chicks were fed in each of 10 lots. The protein content of the rations fed these lots varied from 11.6 to 30 percent.

During the first 6 weeks the optimum protein content for growth was approximately 25 percent, from 6 to 10 weeks 18 to 20 percent, and after this time about 15 percent. The optimum amount over a 12-week period was approximately 19 percent protein. A level of protein over 25 percent approached an excess detrimental to growth. The efficiency of food utilization decreased with age, and mortality was lessened, other factors being equal, the nearer the protein content of the ration approached the optimum. Both high and low protein intake, particularly the former, tended to destroy the barring and to change the contour and texture of the feathers. The optimum level of protein for growth was not necessarily the optimum level for proper feather development. Slipped tendons were not primarily due to a high protein intake as such. The development of "crow heads" was a dietary rather than a genetic factor.

The vitamin D requirements of chickens grown in the absence of sunlight, J. R. COUCH, G. S. FRAPS, and R. M. SHERWOOD (*Texas Sta. Bul. 521 (1935), pp. 31*).—In order to determine how much vitamin D was required in rations fed to chicks which did not have access to sunlight, four diets differing somewhat in their ingredients so as to represent different feeds and varying in their calcium and phosphorus content were studied. The rations and cod-liver oil used were assayed for vitamin D.

Chicks fed a ration containing the proper amounts of calcium and phosphorus apparently needed no additional vitamin D during the first 6 weeks, even in the absence of sunlight. Cockerels appeared to have a higher vitamin D requirement than pullets. The vitamin requirement varied with the particular factor being considered in deciding upon the effect of vitamin D, and gain in weight required more vitamin D than any of the other factors studied. The nature of the ration and especially the calcium and phosphorus content appeared to affect the number of vitamin D units required by growing chicks.

On a ration containing 1.48 percent calcium and 0.65 percent phosphorus, chicks required 12.3 international units of vitamin D from cod-liver oil per 100 g of feed for maximum growth and best feed utilization and 3.1 international units for prevention of rickets and crooked breastbones and the calcification of bones at 12 weeks. On a ration containing 0.96 percent calcium and 0.66 percent phosphorus chicks required up to 12 weeks of age 50.2 international units from cod-liver oil per 100 g of feed for maximum growth, best feed utilization, and calcification of bones, and 12.3 international units for the prevention of rickets and crooked breastbones. On rations containing 1.26 and 1.36 percent calcium and 0.77 and 0.78 percent phosphorus, respectively, chicks required up to 12 weeks of age 6.7 international units of vitamin D from cod-liver oil per 100 g of feed for maximum growth and calcification of bones and with the first ration for prevention of crooked breastbones and best feed utilization and 3.4 international units for prevention of rickets, while with the second ration 3.4 units were required for the prevention of crooked breastbones and best feed utilization. The maximum level of vitamin D may not have been fed in these last two rations.

The vitamin G requirements of the chick, S. LEPKOVSKY and T. H. JUKES (*Jour. Biol. Chem., 111 (1935), No. 1, pp. 119–131, figs. 5*).—The California Experiment Station found that the syndrome caused by feeding chicks a diet of heated corn meal, wheat middlings, and commercial casein could be cured by a filtrate from liver extract from which the flavins had been removed by absorption on fuller's earth. The fuller's earth absorbate of liver extract,

containing vitamin G (B_2), markedly promoted growth in chicks when added to a diet of unheated corn meal, wheat middlings, and purified casein. When the heated diet was made with purified casein instead of commercial casein, the addition of the filtrate cured dermatitis but did not restore growth; the addition of the absorbate neither cured dermatitis nor restored growth; while the addition of both the filtrate and absorbate cured dermatitis and restored growth. The factor curing dermatitis caused by the heated diet was also found in extracts of alfalfa leaf meal and rice bran.

The filtrate from liver extract had no effect on the vitamin G deficiency in rats, which was cured by the absorbate even after it had been heated at 120° [F.] for 24 hr. Liver absorbate promoted growth when added to a purified diet of cornstarch, purified casein, cod-liver oil, paper pulp, and a salt mixture supplemented with rice bran extract, low in vitamin G. Similar results were obtained with a purified diet containing a high level of lard, and a peculiar type of dermatitis was noted in chicks on diets high in lard. It is concluded that an aqueous extract of liver contained vitamin G and the factor reported by Kline, Keenan, Elvehjem, and Hart (E. S. R., 69, p. 844), both of which are distinct from vitamin B and necessary for normal growth in the chick.

Hemorrhagic chick disease of dietary origin, H. J. ALMQUIST and E. L. R. STOKSTAD (*Jour. Biol. Chem., 111 (1935), No. 1, pp. 105–113*).—Continuing this study (E. S. R., 74, p. 683) at the California Experiment Station, it was found that fish meal preparations given a washing treatment and dried at once showed little variation in the severity of the disease from that obtained on the basal diet. It was evident that the protective action developed in wet fish meal could not be explained on the basis of the removal of a water-soluble toxic factor. The results of replacing fish meal with varying proportions of purified casein indicated the absence of any specific prohemorrhagic factor in the fish meal. Before it could be assumed that such a factor was present in any feed ingredient, it must be made certain that weedy or green extraneous material and material acted upon by micro-organisms were not present as contaminants.

It was observed that faster individual chick growth or better growth-promoting diets enhanced the severity of the disease. Results also indicated that little weight could be placed on gizzard erosions in the diagnosis of the hemorrhagic disease. The most outstanding feature of the disease was the marked hemophilia. It was evident that chlorophylls and sterols with chlorophylls were without effect on the disease. Neither carotene nor xanthophyll could be regarded as antihemorrhagic agents, and the active factor was not an acid or an ester. Efforts to remove the factor from ether solutions by means of aqueous mineral acids failed.

Influences of rations and storage on the physical characteristics of eggs, F. D. PERRY (*Iowa Sta. Res. Bul. 192 (1936), pp. 32, pl. 1, figs. 3*).—The object of this study was to determine the effect of the various rations and storage on the physical characteristics of eggs. Dried skim milk, meat and bonemeal, corn gluten meal, soybean oil meal, and combinations of meat and bonemeal and dried skim milk were fed at levels varying from 0 to 15 percent to 892 hens in 15 experimental pens. All of the eggs produced during 1 week in different months in spring and summer were candled, weighed, placed in commercial storage for 6 mo., and then candled and weighed again.

It was found that the level of protein supplement apparently did not influence the loss of weight of eggs during storage. Variations in the percentage of thick albumin in fresh and storage eggs were not definitely attributed to the amount or kind of supplement fed. There was no regular variation in yolk indexes either before or after storage which was consistent over a 2-yr. period

with the amount of supplement fed. Yolk color influenced yolk shadow and yolk movement as determined before the candle. Dark yolk shadows did not necessarily indicate age in the egg. The percentage of thick albumin within the ranges studied did not influence yolk shadow and yolk movement. Loss of weight during storage could not be predicted from appearance of yolk shadow and movement before storage. Loss of weight during storage was related to apparent shell porosity The season at which eggs were stored did not influence storage qualities as measured by yolk index, loss of weight, and percentage of thick albumin.

Bacteriological studies of dressed poultry.—I, Preliminary investigations of bacterial action at chill temperatures, A. G. LOCHHEAD and G. B. LANDERKIN (*Sci Agr., 15 (1935), No. 11, pp. 765–770, fig. 1; Fr. abs., p. 770*).—An investigation was undertaken at the Dominion Experimental Farm, Ottawa, to obtain information concerning the nature of the bacterial changes involved and the factors which determine the keeping quality of dressed poultry.

It was shown that the deterioration of dressed poultry at 30° and 32° F. to the point where a noticeable odor occurred was essentially a surface spoilage. The first odor was due to the development of bacteria on the skin surface and reached a point where it was objectionable before there was any significant decomposition of or noticeable increase in the bacteria in the muscular tissue. The first signs of surface odor were apparent when the bacteria count on the skin exceeded approximately 2,500,000 per square centimeter.

The predominating types of organisms developing on the skin were of the genera *Micrococcus*, *Flavobacterium*, and *Achromobacter*. Of those isolated six species are described, all of which were cold-tolerant rather than cold-loving. The differences in bacterial development at 30° and 32° were quantitative rather than qualitative.

DAIRY FARMING—DAIRYING

[Dairy cattle and dairy products investigations in Iowa] (*Iowa Sta. Rpt. 1935, pp. 46, 47, 49, 57–59, 93–100*).—Investigations with dairy cattle yielded results on the persistency and inheritance of milk and fat production among cows in Iowa cow-testing association herds, by J. L. Lush; the influence of irradiated yeast and *Aspergillus niger* on the antirachitic potency of cows' milk, by B. H. Thomas and C. Y. Cannon; the relation of vitamin E to sterility in goats, and the influence of the physical properties of milk on its rate of digestion in vivo, both by Cannon, Thomas, and D. L. Espe; and a comparison of high fiber and low fiber content in the dairy cow ration, by Cannon, E. N. Hansen, and Espe.

With dairy products, data were obtained on the influence of acidity in the cream on fat losses in buttermilk, a study of the kinds of acids in butter and the distribution of these acids between the water and fat phases of butter, and effect of neutralizers on fat losses in buttermilk and the quality of the butter, all by E. W. Bird; *Pseudomonas fragi*, an organism causing rancidity in butter, micro-organisms causing surface taint in butter; use of *Streptococcus lactis* in butter cultures, mold powders for use in making Blue cheese, *Alcaligenes viscosus dissimilis*, products formed by *S. citrovorus* and *S. paracitrovorus* from citric acid and from lactic acid, and methods of preparing butter cultures for mail shipment, all by B. W. Hammer; the manufacture of a special Swiss-type cheese, by E. F. Goss and M. Mortensen; and protein and fat metabolism of various strains of *Penicillium roqueforti* used in Iowa Blue cheese, by C. B. Lane, Hammer, and Goss.

[Investigations with dairy cattle and dairy products in Missouri] (*Missouri Sta. Bul. 358 (1935), pp. 44–48, 54–57*).—Data obtained in investigations with dairy cattle are reported on the functional individuality of the mammary glands of the udder of the dairy cow, variation in the percentage fat content of the milk of dairy cattle, and comparison of the average yearly fat test of the first official record with the yearly fat test for succeeding records, all by C. W. Turner; the effect of the injection of sterile solutions, milk, and oxygen into the udder of the dairy cow on the composition and yield of milk, by Turner and E. R. Garrison; a study of the form elements of the blood of dairy cattle, by H. A. Herman; quantitative estimation of lactose in the mammary glands of rabbits, by Turner and A. J. Bergman; the influence of live weight on the efficiency of milk production in dairy cattle, by S. Brody and R. C. Proctor; and effects of short-time gestations upon the lactation with reference to primary persistency and total yield, by W. Gifford.

Results with dairy products were obtained in tests on the relation of age and temperature to the physical qualities of different flavored ice cream, by W. H. E. Reid; a microscopic study of the effect on the crystalline structure of vanilla ice cream, by Reid and M. W. Hales; and the distribution of the natural oxidation-reduction equilibrium of the milk with special reference to the use of dehydrated milk in the manufacture of cottage cheese, by Reid and R. L. Brock.

[Dairy cattle investigations in New Mexico] (*New Mexico Sta. Rpt. 1935, pp. 36–38, 39*).—Results obtained in these studies are reported on the physiological effect of a hegari fodder and cottonseed meal ration on dairy cows, the effect of a hegari fodder and cottonseed meal ration on the vitamin A content of butterfat produced by dairy cows, and milk goat improvement by breeding.

[Dairy cattle investigations in South Carolina] (*South Carolina Sta. Rpt. 1935, pp. 60–62, 133–135, fig. 1*).—Studies with dairy cattle produced results on a method of preserving legume crops as silage, and grazing tests with milking cows on permanent pasture, both by E. C. Elting and J. P. LaMaster; and winter grazing crops for dairy cattle, by E. W. Faires.

[Investigations with dairy cattle and dairy products in Texas] (*Texas Sta. Rpt. 1934, pp. 17, 117–120, 124*).—Results obtained in studies with dairy cows are reported on the feeding value of unground v. ground grain, by A. L. Darnell and O. C. Copeland; cottonseed meal and hulls as a ration for lactating dairy cows, by Copeland; and permanent pastures for east central Texas, by Copeland, B. L. Warwick, and E. B. Reynolds. Data on the absorption of light by carotene added in various amounts to butterfat are noted by R. Treichler, M. A. Grimes, and G. S. Fraps, and on carotene as related to the vitamin A potency of butterfat, by Grimes.

[Investigations with dairy cattle and dairy products in Washington] (*Washington Sta. Bul. 325 (1935), pp. 28–34*).—These studies, partly in cooperation with the U. S. Department of Agriculture, yielded information on the breeding of a herd of purebred Holstein-Friesian cattle pure in its inheritance for high milk and butterfat production through the use of proved sires, and the feeding value of green stacked silage from oats and peas, both by R. E. Hodgson and J. C. Knott; the determination with sheep of apparent digestibility by modified procedures based on iron and silica in the feces, by Knott, H. K. Murer, Hodgson, and E. V. Ellington; the nutritive value of home-grown hay and silage rations for dairy cattle, by Hodgson, Knott, Murer, and R. R. Graves; and the utilization of silage from cull apples and cull apples and alfalfa as feeds for dairy cows, by Knott, Murer, E. L. Overholser, and Hodgson.

With dairy products, results were obtained on the correlation of cream quality as determined by various systems of cream grading with butter quality as fixed by commercial graders and the value of the H-ion determination of the butter serum in the scoring of butter, by H. A. Bendixen, C. C. Prouty, and Ellington; and the effect of pasteurization upon the bacterial content of high quality milk as determined by carbon dioxide production, by Prouty and Ellington.

[Dairy cattle investigations in Wyoming] (*Wyoming Sta. Rpt. 1935, pp. 10–12*).—Data obtained in these studies are reported on improvement of production by breeding, producing milk without grain, ground barley compared with dried molasses beet pulp, and palatability of various hays.

A method of harvesting samples of pasture forage, W. B. Nevens and A. F. Kuhlman (*Jour. Dairy Sci., 18 (1935), No. 12, pp. 793, 794, fig. 1*).—In this paper, from the Illinois Experiment Station, the authors describe a simple device made of strap iron for use in harvesting small samples of pasture forage.

Lespedeza and alfalfa hay for dairy cows, C. D. Grinnells (*North Carolina Sta. Bul. 302 (1935), pp. 21, fig. 1*).—The results reported in this bulletin are based on four separate feeding trials, each of which was divided into three 30-day experimental periods. Cows in each trial were divided into two lots and were fed the same basal grain mixture and corn silage. Alfalfa and lespedeza hay were fed, using the double reversal method.

There was no significant difference in the gains in body weights on the two kinds of hay. On the basis of total digestible nutrients required per 100 lb. of milk produced, alfalfa hay was 4.9 percent more efficient than lespedeza hay. In three of the trials the alfalfa hay was somewhat more palatable than the lespedeza hay. The stems of lespedeza hay appeared to be tough and stiff and were not relished by the cattle. There was a greater tendency for the leaves of lespedeza to shatter than was noted with alfalfa. The results indicated that alfalfa hay was a little more efficient than lespedeza hay for milk and butterfat production.

The author points out the advantages and uses of lespedeza under Southeastern conditions.

Influence of temperature on respiration of cows, M. Kleiber and W. Regan (*Soc. Expt. Biol. and Med. Proc., 33 (1935), No. 1, pp. 10–14, fig. 1*).—Studies at the California Experiment Station showed that an increase in environmental temperature above 10° C. increased the respiratory frequency of two cows according to the Arrhenius equation with a temperature characteristic of 12,000 and 13,000 calories, respectively. Cooling inspired air in a hot environment decreased the respiratory frequency and the rate of ventilation and increased the depth of breathing. In a cold environment heating the inspired air did not significantly affect respiration. Shallow breathing at high frequency with increased dead space per breath enabled the animals to combine a large total ventilation and evaporation of water with a relatively small alveolar ventilation.

Causes of growth and function of udder of cattle, C. W. Turner (*Jersey Bul. and Dairy World, 55 (1936), No. 2, pp. 33, 34, 40, 41*).—In this article from the Missouri Experiment Station the author describes the experimental work from all sources having a bearing on the growth and function of the udder. The functions of the various known hormones in the stimulation of the mammary gland are also discussed. The practical application of this information to milk production is pointed out.

The influence of streptococcic infection of the udder on the flavor, chloride content, and bacteriological quality of the milk produced, C. S.

BRYAN and G. M. TROUT (*Jour. Dairy Sci., 18 (1935), No. 12, pp. 777–792*).—In order to study the association between salty milk, quality of milk, and mastitis, the Michigan Experiment Station examined samples of milk from two herds known to have mastitis and from one herd entirely free of mastitis. In all, 258 samples from 60 cows covering a period of 6 weeks were examined.

Of the infected samples from the infected herd, 56 (90.9 percent) were criticised for having a salty flavor, while of the noninfected samples from these herds 25 (20.5 percent) were found to have a salty flavor. Only 14.8 percent of the samples from the negative herd were criticised, and these were from cows almost dry or far advanced in lactation. With the infected samples the averages of the percent chlorides were 0.192 and 0.226 and with the noninfected samples 0.167 and 0.169, respectively. The milk from the noninfected herd averaged only 0.137 percent chloride. Milk from the infected cows in the two herds scored averages of 19.5 and 18.1 points, while that from the noninfected cows of the same herds scored averages of 20.7 and 21.2 points. The milk from the noninfected herd averaged a score of 21.6 points.

Milk from the streptococcus-free cows was of higher quality as determined by the methylene blue reduction test and the number of leucocytes and bacteria per cubic centimeter than that from infected cows. The next highest quality of milk was produced by the noninfected quarters of infected cows. A streptococcic infection of one or more quarters seemed to influence the quality of the milk secreted by the noninfected quarters of the same udder. The composite and quarter samples of milk from infected cows were the lowest in quality on the basis of the tests used. Although most of the milk from infected cows had a salty flavor, high chloride content, high leucocyte and bacterial counts, and low quality as determined by the methylene blue test, none of these determinations could be used alone to make an accurate diagnosis of streptococcic infection.

The chloride content of cows' milk, W. J. CAULFIELD and W. H. RIDDELL (*Cornell Vet., 25 (1935), No. 4, pp. 333–343, figs. 2*).—At the Kansas Experiment Station the chloride content of the milk from each cow in the herd was determined at monthly intervals over a period of 19 mo. A total of 1,006 individual milk samples was examined, including 327 from Ayrshire, 305 from Holstein, 206 from Jersey, and 168 from Guernsey cows.

No significant difference was observed in the chloride content of the milk from the different breeds. The chloride content of the milk from individual cows varied from 0.07 to 0.29 percent, but 96 percent of all the samples fell within the range of 0.08 to 0.2 percent. The chloride content was highest at the beginning of a lactation period, declined rapidly for the first 10 to 20 days, and was followed by a general upward trend during the remainder of the lactation. Holstein milk was higher in chlorides during the first half of lactation than the milk of other breeds, but during the remainder of the lactation there was no significant breed difference. The weight of chlorides secreted in the milk decreased as lactation advanced, but the decrease was not proportional to the decrease in milk production. Variations in chloride content from month to month for the different breeds were not large, while the average variations from day to day and from milking to milking were extremely small.

[Effect of cooling upon the quality of milk for Cheddar cheese] (*Farm Res. [New York State Sta.], 2 (1936), No. 2, p. 5*).—A comparison of the total average of 186 scorings indicated a difference of 1 point in favor of cheese made from milk that was held at 40° F. for 18 hr. previous to making over cheese made from milk held at 70° for the same period. Milk produced under

the best sanitary conditions was not improved as much by cooling as milk containing large numbers of bacteria.

Sage cheese popular in some quarters, J. C. MARQUARDT (*Farm Res. [New York State Sta.], 2 (1936), No. 2, pp. 7, 8*).—The author describes an improved method for the manufacturing of sage cheese.

Cleaning and sterilizing dairy farm utensils, W. J. CAULFIELD, W. H. RIDDELL, and A. C. FAY (*Kansas Sta. Circ. 176 (1935), pp. 16, figs. 10*).—The authors discuss the fundamental points which must be considered in the cleaning and sterilizing of dairy utensils. Special treatment required by certain pieces of equipment are discussed under the headings of milk cans and pails, milking machines, milk bottles, and cream separators. Appended are directions for making a 0.5 percent lye solution and a stock chlorine solution and for detecting impotent chlorine solutions.

Mercury calibrating machine for testing dairy glassware (*Farm Res. [New York State Sta.], 2 (1936), No. 2, p. 7, fig. 1*).—The apparatus used for testing dairy glassware is illustrated, and the method of operating it described.

Dairy glassware is now exceedingly accurate, A. C. DAHLBERG (*Farm Res. [New York State Sta.], 2 (1936), No. 2, pp. 4, 5*).—In this article the author describes the procedure of testing and the progress that has been made in the standardization of dairy-testing glassware.

VETERINARY MEDICINE

[Contributions on diseases and parasites of livestock and their control] (*Jour. Amer. Vet. Med. Assoc., 88 (1936), No. 3, pp. 225–232, 242–273, 275–297, 299–336, 338–360, 363–374, 375–384, 386–392, 397–420, figs. 10*).—Contributions presented at the thirty-ninth annual meeting of the United States Live Stock Sanitary Association, held in December 1935, are as follows: Some Recent Trends in the Study of the Mechanisms of Immunity, by P. R. Cannon (pp. 225–232); The Significance of Low-Titre Agglutination, by A. F. Ranney (pp. 242–249); The General Progress of the Cooperative Bang's Disease Project, by A. E. Wight (pp. 249–253); Bang's Disease Control in Oregon, by S. B. Foster (pp. 253–257); The Results of Retests in the Federal Bang's Disease Project, by C. P. Fitch (pp. 258–270), contributed from the Minnesota Experiment Station; The Role of the Veterinarian in the Public Health Program, by W. Giltner (pp. 275–282); Parasites of Importance in Meat Inspection in North America, by T. W. M. Cameron (pp. 282–288); Bovine Mastitis, by D. H. Udall (pp. 289–297); Swine Dysentery in Iowa From a Field Standpoint, by R. M. Hofferd (pp. 299–310); Swine Erysipelas, With Particular Reference to Serological Diagnosis, by H. W. Schoening and G. T. Creech (pp. 310–316); Vesicular Exanthema of Swine, by J. Traum (pp. 316–327); Community Sales, a Factor in the Spread of Swine Diseases, by H. E. Curry (pp. 334–336); The Necessity for Continuing Tuberculosis Control and Eradication Activities in Modified Accredited Areas, by W. Wisnicky (pp. 338–346); The Progress and Status of Cooperative Tuberculosis-Eradication Work, by A. E. Wight (pp. 347–352); Johne's Disease, a Menace to the Cattle Industry, by A. J. DeFosset (pp. 352–360); The Present Status of Infectious Equine Encephalomyelitis in the United States, by L. T. Giltner and M. S. Shahan (pp. 363–374); Pullorum Disease in Turkeys, With Some Reference to Fowl Typhoid in Turkeys, by E. P. Johnson and G. W. Anderson (pp. 375–381), contributed from the Virginia Experiment Station; [Investigations of Pullorum Disease in California Turkey Poults], by W. R. Hinshaw (pp. 382, 383); Acid-Fast Organisms Found in So-Called Bumblefoot of Chickens, by E. [illegible]

(pp. 386–392) (see p. 110); Fowl-Pox Virus Vaccination of Day-Old Chicks—A Preliminary Report, by R. E. Lubbehusen, J. R. Beach, and W. H. Busic (pp. 397–412) (see p. 110); and Laryngotrachetis, by C. S. Gibbs (pp. 413–419), contributed from the Massachusetts Experiment Station.

The retesting work, the details of which are given in nine tables, is considered by Fitch (pp. 258–270) to indicate that (1) the disease can be eliminated from herds by the application of the agglutination test, (2) the results obtained by the plate method and the tube method of testing, when satisfactory antigens are used and the work is carried out by competent individuals, are equally satisfactory, (3) additions to tested herds are a serious problem, (4) retests of infected herds should be conducted at frequent intervals, not earlier than 30 days or later than 60 days apart, and (5) noninfected herds should be carefully guarded to prevent the entrance of infection.

Manson's tropical diseases, a manual of the diseases of warm climates, edited by P. H. MANSON-BAHR (*London, Toronto, and Melbourne: Cassell & Co., 1935, 10. ed., rev., pp. XX+1003, pls. [43], figs. [418]*).—A revised and enlarged edition of this work (E. S. R., 54, p. 153), in which the expansion on the clinical side is said to have necessitated the elimination of much scientific matter in medical protozoology, helminthology, and entomology.

Treatise on exotic veterinary and comparative pathology.—I, Filtrable virus diseases, G. CURASSON (*Traité de pathologie exotique vétérinaire et comparée.—I, Maladies a ultra-virus. Paris: Vigot Bros., 1936, pp. 610*).—Following a general introduction, this first volume deals with pernicious anemia of the sheep and the goat (pp. 23–27); rinderpest (pp. 28–302); equine influenza (pp. 303–371); East African hog cholera (pp. 372–378); fowl pest and similar diseases of poultry (pp. 379–393); sheep and goat (pp. 394–463), camel (pp. 464–469), and swine (pp. 470–482) pox; foot-and-mouth disease (aphthous fever) (pp. 483–495); bluetongue of sheep (pp. 496–519); rabies (pp. 520–554); Nairobi disease (pp. 555–562); Rift Valley fever (pp. 563–578); 3-day fever of the ox (pp. 579–589); and infectious pleuropneumonia of the goat (pp. 590–606). Lists of bibliographical references to the several diseases are included.

[Report of work in animal pathology by the Iowa Station] (*Iowa Sta. Rpt. 1935, pp. 63, 64, 133, 134, 157–159*).—The work of the year in animal pathology referred to (E. S. R., 72, p. 843) includes the etiology of range paralysis in poultry and a study of the egg as a possible mode of transmission of range paralysis in chickens, both by C. Murray, C. D. Lee, and H. L. Wilcke; the effect of feeding drought-injured corn to cattle, by E. R. Henson, C. C. Culbertson, I. E. Melhus, H. E. Biester, and R. M. Hixon; breeding for resistance to fowl typhoid in poultry, by W. V. Lambert and N. F. Waters; and genetic investigation of resistance and susceptibility to a typhoidlike disease in laboratory animals due to *Salmonella aertrycke*, by Lambert.

[Report of work in veterinary medicine by the Missouri Station] (*Missouri Sta. Bul. 358 (1935), pp. 103–108*).—The work of the year in animal pathology referred to (E. S. R., 72, p. 528) includes blackhead in turkeys and leucosis of fowls, both by A. J. Durant and H. C. McDougle; transmission of Bang abortion infection of swine to cattle, the significance of low agglutination reactions in unbred gilts, and maximum titer studies in abortion-infected herds of cattle, both by C. Elder; comparative results obtained with the tube agglutination and rapid or plate tests on low reacting sera, by Elder and F. L. Piercy; transmission of abortion infection in cattle from immune dams to progeny, and toxemia in sheep, both by Elder and A. W. Uren.

[Report of work in veterinary medicine by the Texas Station] (*Texas Sta. Rpt. 1934, pp. 10–15, 17, 223–226*).—Brief reference is made to the work of the year (E. S. R., 71, p. 837) with loin disease of cattle, infectious bovine

abortion, stomach worms in sheep and goats, hard yellow livers in sheep and cattle, sheep losses in the feed lot, chronic nephritis in cattle and sheep, and a new disease in cattle (apparently a form of intoxication distinct from loin disease), all by H. Schmidt; locoweed poisoning, by F. P. Mathews, G. S Fraps, and E. C. Carlyle; and miscellaneous poisonous plants (*Gutierrezia microcephala* (erroneously reported as *G. sarothrae* last year), *Senecio longilobus, S. riddellii, Rhus virens, Agave lechuguilla, Nolina texana, Baileya multiradiata, Hymenoclea monogyra, Sartwellia flaveria, Lippia ligustrina*, and *Tribulus terrestris*), by Mathews and Schmidt. Work at the Sonora Substation, also reported upon, relates to the toxicity of bitterweed (*Actinea odorata*), swellhead in sheep and goats, hard yellow livers in sheep and cattle, contagious ecthyma (sore mouth) of sheep and goats, poisonous plant feeding (*Agave lechuguilla*), and chronic copper poisoning, all by I. B. Boughton and W. T. Hardy.

[Report of work in animal pathology and parasitology by the Wyoming Station] (*Wyoming Sta. Rpt. 1935, pp. 15–17, 22, 23, 25, 26*).—The work of the year relating to animal pathology and parasitology (E. S. R., 72, pp. 689, 694) briefly reported upon includes selenium in plants and soils (E. S. R., 73, p. 843); locoweed (*Oxytropis sawimontana*); calf diphtheria; stiff lambs, a report of which has been noted (E. S. R., 73, p. 391); roup in chickens; sage chickens as carriers of coccidiosis; and the intermediate host of the tapeworms of sheep.

Report on parasites of domesticated animals and man in Hawaii, M. C. HALL (*U. S. Dept. Agr., Bur. Anim. Indus., [1936], pp. 9*).—A report is made of a survey conducted by the U. S. D. A. Bureau of Animal Industry in Hawaii in October and November 1935 in cooperation with the Hawaii Experiment Station.

[Studies in comparative pathology, etc., in Japan] (*Jour. Japan. Soc. Vet. Sci., 14 (1935), Nos. 1, pp. 1–102, pls. 13; 2, pp. 111–246, pls. 8, figs. 37; 3, pp. 273–356, pls. 11; 4, pp. 363–444, pls. 9*).—The contributions presented in No. 1 (E. S. R., 73, p. 537) include the following: Swine Pox in Chosen, by S. Akazawa and T. Matsumura (pp. 1–19, Eng. abs. pp. 17–19); A Case of Congenital Stenosis of the Esophagus in a Young Dog [trans. title], by S. Yamamoto and O. Emoto (pp. 20–23, Japan. abs. p. 23); Studies on the Trematodes Invading *Lymnaea* Snails as the First Intermediate Hosts Found in the Vicinity of Mukden—I, On the Structure of Their Cercariae, Effects of Their Infestation on the Host Snails, as Well as the Cyst Formation of Stylet Cercariae by the Action of the Mammalian Blood Serum, by S. Ono (pp. 24–38, Eng. abs. pp. 36–38); Haemacytological Changes in Hog Cholera—I, Observations on the "Substantia Granulo-filamentosa" in Red Blood Cell—Reticulocytes, by S. Ishii, S. Watanabe, and Y. Miura (pp. 39–51, Japan. abs. pp. 51, 52); Shwartzman's Phenomenon in Tuberculous Guinea Pigs, by M. Watanabe and K. Misumi (pp. 53–64, Eng. abs. pp. 63, 64); and An Anatomical View of a Monkey Infected With Oesophagostoma Intestinalis and Studies on *Oesophagostomum apiostomum* (Willach 1891), by O. Isshiki (pp. 65–102, Eng. abs. pp. 97–101).

The contributions in No. 2 include the following: Experimental Studies on Swine Erysipelas Bacillus [*Erysipelothrix rhusiopathiae*] Found in Fishes, by S. Kondo and K. Sugimura (pp. 111–138, Eng. abs. pp. 136–138); Studies on the Physical, Chemical, and Cytological Properties of the Blood in Rinderpest, by T. Inoue and M. Umezu (pp. 139–188, Eng. abs. pp. 186–188); On the Changes in the Quantity of Glycogen, Lactic Acid, and Adrenalin in the Organs During the Course of Rinderpest, by M. Umezu and T. Inoue (pp. 189–193, Eng. abs. pp. 192, 193); The Pathogenesis of Bloody Sweat (Hema-

tidrosis) of the Horse [trans. title], by A. Ichioka and T. Kato (pp. 194–218 Ger. abs. pp. 217, 218); Tubercle Bacillaemia, by M. Watanabe (pp. 220–231, Japan. abs. pp. 229–231); and Studies on the Trematodes Invading *Lymnaea* Snails as the First Intermediate Hosts Found in the Vicinity of Mukden—II, On the Encystation and Development of Echinostomidae, by S. Ono (pp. 232–246, Eng. abs. pp. 245, 246) (see above).

The contributions in No. 3 include the following: Experimental Studies on the Infectious Abortion in Mares—I, Bacteriological Observations (pp. 273–294, Eng. abs. pp. 292–294), and II, Hematological Observations (pp. 295–313, Eng. abs. pp. 310–313), both by K. Hirato, S. Miura, T. Ôya, and K. Kasai; On the Pure Anti-flagellar Serum Prepared by the Injection With a Culture Filtrate of *Bacillus suipestifer*, by K. Itabashi (pp. 314–321, Eng. abs. pp. 320, 321); Experimental Studies Regarding Living Swine Erysipelas Vaccine—II, The Pathogenicity and Immunizing Property for Swine of Avirulent Swine Erysipelas Bacilli Obtained by Treating With Trypaflavin, by S. Kondo and K. Sugimura (pp. 322–339, Eng. abs. pp. 338, 339) (E. S. R., 68, p. 812); and On the Relationship of the So-called "Histiozytäre Zellen" to the Anaemia From the Haematological Observation of the Infectious Anaemia of Horses, by S. Ishii and N. Nakamura (pp. 340–356, Eng. abs. pp. 354–356).

The contributions in No. 4 include the following: Susceptibility of the Mouse to Glanders [trans. title], by I. Mochida (pp. 363–391, Ger. abs. pp. 387–391); Studies on Trichomonas Abortion in Cattle, by H. Futamura (pp. 392–416, Eng. abs. pp. 413–416); and Pathological Studies of Rinderpest—Report II, Pathological Anatomy of the Spleen [trans. title], by T. Fukushima and K. Miyairi (pp. 417–444, Ger. abs. pp. 442–444) (E. S. R., 72, p. 250).

[Contributions on diseases and parasites of domestic animals] (*Indian Sci. Cong. Proc. [Calcutta], 22 (1935), pp. 326, 407, 408, 409, 410*).—Contributions presented at the Twenty-second Indian Science Congress, held at Calcutta in January 1935, and here abstracted, include the following: Incidence of Helminthic Parasites in Cattle in Lahore, by S. Dyal (p. 326); The Permeability of the Placenta of Goats to Rinderpest Virus, by P. C. Banerji and R. N. Mohan (p. 407); The Etiology of So-called "Calcutta Sore" of Cattle (p. 407), Sequelae to Foot and Mouth Disease (pp. 407, 408), and Encephalo-myelitis in a Goat (p. 408), all by S. C. A. Datta; On the Occurrence of *Stilesia vittata* (Cestoda) in Ovines in India (p. 409) and The Common Worms of Sheep and Goats in India and Their Control (p. 409), both by G. D. Bhalerao; Immunization of Horses Against Tetanus in Tropics, by A. K. Sen, A. K. Hazra, and S. K. Bose (p. 409); and The Etiology of Enzootic Bovine Haematuria, by S. C. A. Datta (p. 410).

Annual report of the Veterinary Department, Straits Settlements, for the year 1934, S. H. Whitworth (*Straits Settlements Vet. Dept. Ann. Rpt., 1934, pp. 15*).—Included in this report is an account of the occurrence of and control work with infectious diseases of livestock (pp. 9–11) (E. S. R., 72, p. 689).

Government of Northern Rhodesia, Department of Animal Health, annual report for the year 1934, J. P. A. Morris and P. L. le Roux (*North. Rhodesia Dept. Anim. Health Ann. Rpt., 1934, pp. 39*).—An account of the occurrence of and control work with the infectious and parasitic diseases of livestock is included in this report.

Report of the director, animal health station, J. A. Rudd et al. (*Queensland Dept. Agr. and Stock, Ann. Rpt., 1934–35, pp. 134–138*).—A brief report is made of the work of the year in animal pathology and parasitology.

Latent infections, K. F. Meyer (*Jour. Bact., 31 (1936), No. 2, pp. 109–135*).—This discussion, presented as a presidential address before the Society of

American Bacteriologists in New York in December 1935, reviews the subject in its broadest aspects.

Surgical maggots: A study of their functions in wound healing, F. C. MESSER and R. H. MCCLELLAN (*Jour. Lab. and Clin. Med., 20 (1935), No. 12, pp. 1219–1226, figs. 4*).—It was found that chronic osteomyelitis wounds healing in the presence of blowfly larvae develop reactions more alkaline than pH 7.4, in contrast to wounds dressed only with physiologic salt solution. It has been shown that sterile *Lucilia sericata* larvae produce sufficient ammonia to account for this excess alkalinity. "The excess alkalinity is probably a factor in bacteriostasis and wound healing. Blowfly larvae are shown to excrete a relatively weak proteolytic enzyme, while they contain in their digestive tract a more powerful one. The relative strength and location of these enzymes permit the removal of necrotic tissue from a wound with a minimum of irritation. The assimilation by the larvae of the protein split products of necrotic tissue removes the latter from the wound where they would otherwise putrefy or be absorbed to the detriment of the patient. Maggot therapy depends for its beneficial action on the presence of living larvae, which cannot be successfully replaced by pastes or extracts of maggots."

Studies on pseudorabies (infectious bulbar paralysis, mad itch).—III, The disease in the rhesus monkey (Macaca mulatta), E. W. HURST (*Jour. Expt. Med., 63 (1936), No. 3, pp. 449–463, pls. 2*).—In further studies (E. S. R., 71, p. 697) it was found that "in the monkey (*M. mulatta*) the virus of pseudorabies, pantropic in the rabbit, behaves as a strict neurotrope. Infection, usually fatal, readily follows intracerebral and intracisternal inoculation of rabbit virus, and often intrasciatic inoculation; the symptomatology of the ensuing disease is described."

On differentiation in the suipestifer group and on resistance to phage, P. LEVINE and A. W. FRISCH (*Jour. Immunol., 30 (1936), No. 1, pp. 63–88*).—In the studies reported phages for various *Salmonella suipestifer* strains were found to differ in both their direct reactions and their absorption effects. "Such studies with one of the *suipestifer* phages revealed the close parallelism of the specificities revealed by antibody and phage. With one exception, both sorts of reagents revealed the same subgrouping of *suipestifer* strains. Other results point to the existence of further differences of strains within a particular subgroup. For the diagnosis of the species *suipestifer*, the *suipestifer* fraction in a polyvalent phage is less specific than phages for particular strains of the homologous group. The property of any culture in its behavior to phage may be employed along with other criteria to aid in its identification. This is particularly significant for certain cultures which are resistant to phage action but, nevertheless, absorb specifically. The nature of bacterial resistance to bacteriophage is discussed in terms of variation in antigenic composition."

The existence of two distinct serological types of the avian tubercle bacillus [trans. title], W. SCHAEFER (*Compt. Rend. Soc. Biol. [Paris], 120 (1935), No. 40, pp 1185–1188*).—The author finds the avian tubercle bacillus to contain three antigens: An antigen of a group common to the majority of acid-resistant bacilli, a second specific for the avian bacillus, and a third specific for one of the two types of the avian bacillus that he has recognized.

A new method of staining Mycobacterium tuberculosis: A scientific microbiological note, M CARPANO, trans. by H. FAHEL (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 151 (1935), pp. 6, pls. 7*).—A description is given of a method in which tuberculous preparations are stained with modified Z. Neelsen's stain, decolorized with sulfuric acid, stained again with vesuvin, and finally treated with Lugol's solution.

Tularaemia epizootic among groundsquirrels (Citellus pygmaeus Pallus) at Jambatinsky region of western Kazakstan in spring 1934, V. M. TUMANSKII (TUMANSKY) and Z. I. KOLESNIKOVA (*Vest. Mikrobiol., Epidemiol. i Parazitol. (Rev. Microbiol., Épidémiol. et Parasitol.), 14 (1935), No. 3, pp. 263–269, fig. 1; Eng. abs., p. 269*).—Reference is made to an epizootic of tularemia that was observed during the spring of 1934 among susliks (*C. pygmaeus*) and which spread all over the Jambatinsky region of western Kazakstan. The outbreak, which was very severe, began early in the spring among old individuals.

Bang's disease in a naturally infected herd, F. M. HAYES and E. H. BARGER (*Hilgardia [California Sta.], 9 (1935), No. 11, pp. 527–542, figs. 3*).—The studies here reported were commenced in 1922 in a herd of dairy cattle in which 19 percent of the animals were infected with *Brucella abortus*, as indicated by the agglutination test of the blood serum. They were conducted with the view to determining what correlation exists between agglutinins in the blood and those in the milk, and what relation these agglutinins bear to the presence of the organisms in the milk and in the products of normally or prematurely terminated pregnancies. Of the cows reacting positively to the blood-agglutination test, 77.5 percent showed udder infection. It was shown that cows in an infected herd may have *B. abortus* in their udders for a considerable period before agglutinins appear in the blood.

"In 3 cases out of 38, the organism was present in the milk 8 mo. 13 days, 5 mo. 25 days, and 3 mo. 14 days, respectively, before blood agglutinins were demonstrable. The milk from udders harboring *B. abortus* frequently does not contain sufficient agglutinins to be detected by the usual whey-agglutination test in dilutions as low as 1–50 when a composite sample from all quarters is tested. Udders of cows having a positive blood history may continue to carry *B. abortus* when the blood titer has declined to negative in a dilution of 1–50. Cows with declining and low fluctuating blood titers may be spreaders at normal calving when the titer is as low as negative in 1–50. Of the cows reacting positively to the blood agglutination and calving normally, 25.5 percent expelled *B. abortus* at parturition. Cows in an infected herd but with a consistently negative blood reaction in 1–50 over a long period of time do occasionally (0.54 percent) discharge *B. abortus* at a normal parturition. Likewise abortions in cows of this type were accompanied by the discharge of the organisms with the fetus in 0.4 of 1 percent of the abortions in this herd.

"Recovery from Bang's disease is rare in the average life of a cow, and cows with a definite and long-standing positive blood history cannot safely be given a clean bill of health after a few negative tests. Complete removal from the herd of all cows that show agglutinins in 1–50 was the only type of segregation that prevented the spread of Bang's disease in this herd. The data suggest that when this type of segregation fails, search should be made for nonreacting cows which are shedding *B. abortus* in the milk."

Brucella abortus shedder conditions in twenty cows, B. S. HENRY, C. M. HARING, and J. TRAUM (*Hilgardia [California Sta.], 9 (1935), No. 11, pp. 543–566, figs. 11*).—The blood and whey titers for *B. abortus* of 20 cows were studied at monthly intervals during a complete lactation period and correlated with the shedder condition as determined by guinea pig inoculations and cultures. These animals came from a so-called infected group of approximately 160 lactating animals, most of which were, or had been, reactors to the agglutination test, and had been segregated from a herd of approximately 800 animals. Only 20 of the first 23 animals which calved or aborted were taken for use in the study so that no selection might be made which would influence the results.

"No milk sample was found to contain *B. abortus* when the blood titer of that cow at the time the milk was collected was below 1–50. When the corresponding blood titer was 1–200 or over, *B. abortus* was isolated from the milk of one or more quarters in 96 3 percent of the udder tests. The percentage of shedders of *B abortus* found among cows with blood titers of 1–100 or over increased rapidly as successive tests of the cows were made over a period of time. The diagnosis of shedder condition, based on several consecutive blood-serum agglutination tests, was possible and feasible in these 20 animals at any time throughout the period of the tests. The agglutination titer of the whey is less dependable as an indicator of infection and is more subject to fluctuations than is the blood titer. *B. abortus* was not recovered from any udder in which the milk from all individual quarters showed titers of less than 1–25.

"In only two instances was *B. abortus* obtained from a quarter which had a negative whey titer, and in each case other quarters of the same udder had high titers and were excreting the organism. Of 38 quarters proved to be infected with *B abortus*, 23 eliminated the organism at every test throughout the period. The remaining 15 infected quarters failed to infect guinea pigs on more or less irregular occasions only. The spread of infection from quarter to quarter, as indicated by the excretion of *B. abortus*, was very slow. None but the 'S' type of *B. abortus* were found in the milk of these naturally infected cows."

The records of typical individual cows, nine in number, presented in graph form, are appended.

A study of the resistance of individual cows to infectious abortion (Bang's disease), W. B. AULL, J. P. LAMASTER, and E. C. ELTING (*South Carolina Sta. Rpt. 1935, pp. 37, 38*).—A brief reference is made to the work of the year with this project.

Early developmental stages of nematodes occurring in swine, J. E. ALICATA (*U. S. Dept. Agr., Tech. Bul. 489 (1935), pp. 96, figs. 30*).—The results of investigations on the early developmental stages of roundworms of common occurrence in domestic swine, including the eggs, and their first, second, and third larval stages, are reported. The parasites *Gongylonema pulchrum, Ascarops strongylina, Physocephalus sexalatus, Metastrongylus salmi, M. elongatus, Choerostrongylus pudendotectus, Ascaris suum, Trichuris suis, Hyostrongylus rubidus, Oesophagostomum dentatum, Stephanurus dentatus*, and *Strongyloides ransomi* are thus dealt with. For two of these, *G. pulchrum* and *H. rubidus*, observations on the stages in the definitive hosts are also discussed briefly. The nomenclature of each parasite, its host relationship, geographic distribution, morphology, and bionomics of its early stages are given. A list is given of 143 references to the literature.

Quantitative studies on the neutralization of equine encephalomyelitis virus by immune serum, I, II, M. H. MERRILL (*Jour. Immunol., 30 (1936), No. 2, pp. 185–202*).—Two papers are presented.

I. *Combination of virus and antibody in vitro* (pp. 185–192).—It was found that "when equine encephalomyelitis virus and a subneutralizing dose of immune serum were mixed and then diluted, the titer by intracerebral inoculation was from 10 to 100 times below the titer of the same materials mixed after dilution. When virus was inactivated by mixing with immune serum, all dilutions of the mixture were noninfective upon intraperitoneal inoculation. When each was diluted before mixing, animals receiving the higher dilutions were not protected. The filtrability of the virus was diminished by mixing with subneutralizing doses of immune serum. It is concluded from these results that the virus and immune body combined in vitro. It is considered probable that aggregation of the virus particles occurred."

II. *The "percentage law"* (pp 193–202).—The author found that "the addition of subneutralizing doses of immune serum to suspensions of equine encephalomyelitis virus caused a definite decrease in the titer of the virus, indicating a 90- to 99-percent neutralization. This occurred over a wide range of serum-virus ratios. In the narrow zone of serum-virus ratios in which neutralization was complete there was a direct relationship between the number of infective doses of virus present and the serum required for neutralization. It is believed that two phenomena were being measured, namely, aggregation and neutralization, and it is suggested that the phenomenon of percentage neutralization with the virus in question, as well as with phage, is probably due to aggregation of virus, or phage, particles."

Active immunization of guinea pigs with the virus of equine encephalomyelitis.—I, Quantitative experiments with various preparations of active virus, P. K. Olitsky and H. R. Cox (*Jour. Expt. Med., 63 (1936), No. 3, pp. 311–324*).—It was found that active eastern or western equine encephalomyelitis virus in three forms—chemically untreated but simply passaged through series of mice, adsorbed on alumina Gel C, and precipitated by tannin—yielded practically the same results when employed for the immunization of guinea pigs.

"The virus is not inactivated by the process of adsorption or precipitation; guinea pigs and mice inoculated in the brain with these materials develop lethal encephalomyelitis in the same manner as when chemically untreated mouse passage virus has been used. Moreover, there is no difference in the rate of absorption in vivo of the chemically treated and untreated virus preparations. After storage of the three immunizing preparations—the longest period thus far studied being 2 to 3 mo. for mouse passage and for precipitated suspensions, and 6 mo. for adsorbed material—each was found to contain an amount of virus sufficient to produce immunity in animals against the usual intracerebral test inoculation. Finally, the protection afforded by the three preparations is apparently durable, as is true of many active viruses utilized in preventive treatments.

"The amount of the virus necessary to confer protection may be defined as that which immunizes (1) with the least number of antigenic units, and (2) with the minimum of febrile reaction and blood infection. In proportion as this amount is exceeded, the incidence of fever and of circulating virus increases and, on the other hand, as this amount is decreased, the degree of induced immunity is diminished.

"We have thus shown that for this particular virus and in the guinea pig one or two subcutaneous doses of 1 cc of any of the different virus preparations, each containing 3 by 10^3 to 3 by 10^4 mouse infective units, bring about protection regularly against experimental infection by way of the nose or subcutis. The results are irregular when the test is made by way of the brain. By three injections, resistance is invariably obtained against as many as 10^3 to 10^4 lethal doses, given intracerebrally.

"No matter in what form the virus is given, as mouse passage, or adsorbed, or precipitated material, in certain instances fever occurs and virus circulates. With the amount of virus adequate for immunization (3,000 to 30,000 m. i. u.) a mild or subclinical infection may occur in the guinea pig without other manifestation of disease. Lesser quantities of virus apparently fail to gain a foothold in the animal and thus fail to bring about resistance.

"To conclude, a quantitative basis has been established for the comparison of the immunizing capacities of preparations employed in experimental equine encephalomyelitis in guinea pigs."

True equine piroplasmosis: Clinical observations, hematology, and therapeutics [trans. title], P. Rossi (*Rev. Vét. [Toulouse], 88 (1936), Jan., pp. 5–25, fig. 1*).—This contribution is presented with a list of 35 references to the literature.

Hematology of the fowl, J. W. Kelly and R S. Dearstyne (*North Carolina Sta. Tech. Bul. 50 (1935), pp. 69, pls. 2, fig. 1*).—The first part (pp. 3–18) of this second report (E. S. R., 71, p. 102) of a series of studies of the blood of fowl presents additional data on normal chick blood. The second part (pp. 18–63) reports upon hematological studies on chicks and adults suffering from the acute and chronic form of pullorum disease, respectively, and adult carriers of the infection.

In temperature studies on four baby chicks ranging from the first to the nineteenth day of age, the extremes ranged from 101° to 107.4° F. The mean temperature established in the study was 105.5° for the morning and 105.2° for the evening.

In studies on the relative blood cell levels on 43 normal chicks, the following were the relative ranges—69.8 percent of the total instances showed an erythrocyte content of from 2,270,000 to 3,010,000 per cubic millimeter of blood, and 83.6 percent of the total instances showed a leucocyte content of between 6,000 and 16,000 per cubic millimeter of blood. In the differential leucocyte counts, the following percentages were obtained—heterophiles, 46.5 percent of the counts showed the heterophile percentages to range between 41 and 60; 72 percent of the instances showed 1 percent or less of eosinophiles; and 86 percent of the counts of basophiles showed a range of from 2 to 10 percent. The lymphocyte percentages were as follows—88.4 percent of the instances of small lymphocytes showed a range of from 1 to 40 percent, 76.7 percent of the instances showed an intermediate lymphocyte content of from 0 to 2 percent, and in 81.3 percent of the instances no large lymphocytes were found. In 76.6 percent of the instances from 6 to 20 percent monocytes were present, and 79 percent of the instances showed no myelocytes present. The heterophilic leucocyte counts on 1-day-old chicks showed a higher range than was recorded on chicks that were more than 1 day of age.

"The most effective results in producing pullorum disease in baby chicks were secured by administering the organism by the channels of the eye, the nasal passages, and the nares. Four days were required for cases so inoculated to show the peak of temperature Of 17 chicks inoculated with *Salmonella pullorum*, 14 made constant gains in weight up to the day of peak temperature, at which time a slight loss of weight occurred. The blood studies of inoculated chicks show that the blood structure of such chicks is definitely altered as a result of the disease. In the majority of cases, there was shown a general increase in the heterophilic and the monocytic leucocytes as well as a total numerical leucocyte increase, thus indicating a pathological leucocytosis. One case showed a decrease in leucocytes or a pathological leucopenia. The total erythrocyte count is increased, indicating the existence of a polycythemia. The basophiles and the lymphocytes show a definite decrease in percentage and the eosinophile range is apparently unaffected. The bacteremic form of pullorum disease produces definite morphological changes in the heterophiles and in the monocytes of inoculated chicks as compared to the normal. . . .

"Lack of a suitable volume of blood in baby chicks prevented the determination of the hemoglobin content by the use of the Newcomer hemoglobinometer. Parallel studies run on naturally infected chicks and those inoculated in the laboratory reveal no outstanding differences in the reaction of the blood to the disease. In both methods of infection there is revealed a heterophilic-monocytic leucocytosis. Thirty-two blood studies and hemoglobin determinations

tions on normal pullets are presented. The findings in these studies as far as blood structure is concerned are substantially in agreement with the studies of Cook and Dearstyne and other investigators who made similar studies with the same technic. Twenty-two blood studies and hemoglobin determinations made on proved adult carrier birds are presented for comparison with the blood structure of the normal adult birds studied. These studies reveal an absolute increase in the number of erythrocytes in the blood of the carrier bird as compared with the erythrocyte content of the normal adult. There is a slight increase in numerical leucocyte count. A slight increase in the percentage of heterophilic and of monocytic leucocytes in the blood of carriers as compared with the normal is noted. Morphological differences in the cells of the blood were not observed in these studies. There is an apparent increase in hemoglobin in the blood of the carrier bird."

Acid-fast organisms found in so-called bumblefoot of chickens, H. BUNYEA (*Jour. Amer. Vet. Med. Assoc., 88 (1936), No. 3, pp. 386–392, figs. 3*).—The author reports that the microscopic examination of smear preparations from purulent material taken from bumblefoot lesions of chickens revealed the presence of acidfast organisms possessing morphological characteristics similar to those of *Mycobacterium tuberculosis avium*. "Live fowls possessing such lesions failed to react to the tuberculin test. Histopathological examination of affected tissues failed to show changes suggesting tuberculosis. Efforts to cultivate the acidfast organism were unsuccessful. Animals and fowls were refractory to inoculations with material containing the acidfast organisms. However, one case of bumblefoot was produced experimentally in which the acidfast organisms were subsequently demonstrated. The etiological relationship of the acidfast organism to bumblefoot is not known."

Cultural requirements of the fowl-coryza bacillus, O. W. SCHALM and J. R. BEACH (*Jour. Bact., 31 (1936), No. 2, pp. 161–169*).—In further experiments (E. S. R., 71, p. 854), "an effort was made to determine whether the fowl coryza bacillus requires the presence of both the X and the V factors [Thjötta and Avery (E. S. R., 46 p. 78)] for growth on or in an artificial medium. Twelve different cultures, representing 1 New Jersey, 1 Rhode Island, and 6 California strains, were studied. These cultures varied in their period of cultivation on artificial media for from 4 to 157 transfers made every 4 days.

"It was found that, regardless of strain or age, all cultures of the fowl coryza bacillus required the presence of both the X and the V factors for growth on or in an artificial medium. On this basis, the fowl coryza bacillus is to be classed in the genus *Hemophilus*. The name *Bacillus haemoglobinophilus-coryza-gallinarum*, suggested by De Blieck in 1932 [E. S. R., 67, p. 170], describes the organism satisfactorily, but, because of its length, is awkward and contrary to the rules of nomenclature. The binomial *H. gallinarum*, proposed by Elliot and Lewis in 1934 [E. S. R., 71, p. 540], seems better suited for this organism."

Fowl-pox virus vaccination of day-old chicks, R. E. LUBBEHUSEN, J. R. BEACH, and W. H. BUSIC (*Jour. Amer. Vet. Med. Assoc., 88 (1936), No. 3, pp. 397–412, figs. 6; also in Nulaid News, 13 (1936), No. 11, pp. 40–43, figs. 3*).—The controlled experimental data obtained in a preliminary study indicate that a vaccination take in day-old chicks is accompanied by a systematic reaction which manifests itself by at least a temporary inhibition of normal weight gains and a lowering of vitality. The degree is influenced by the severity and duration of the local reaction, which, in the presence of unfavorable environmental conditions or concurrent disease, may contribute to excessive mortality.

Transmission of Argentine encephalomyelitis of equines in the goose, duck, buzzard, and blackbird [trans. title], P. REMLINGER and J. BAILLY

(*Compt. Rend. Soc. Biol.* [*Paris*], *121* (*1936*), *No. 2, pp. 146–149*).—The authors report having reproduced encephalomyelitis in all birds tested except the chicken.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Iowa Station], J. B. DAVIDSON, E. V. COLLINS, W. G. MURRAY, C. K. SHEDD, H. GIESE, P. E. BROWN, A. A. BRYAN, H. R. MELDRUM, A. J. ENGLEHORN, R. E. BENNETT, Q. C. AYRES, J. M. AIKMAN, A. F. DODGE, H. STEAVENSON, J. FULTS, H. D. HUGHES, F. B. SMITH, G. W. MUSGRAVE, and G. B. MACDONALD (*Iowa Sta. Rpt. 1935, pp. 35–42, 87, 88, 148–152, figs. 6*).—The progress results are briefly presented of investigations of mechanical corn production methods, farm building losses due to wind and fire, use of tractors, tractor track efficiency, development of equipment for checkrowing beets, a new type of terracing machine, the basin method of planting corn, accuracy of 4-row corn checkrowers, wagon and trailer hitches, efficiency of corn pickers, seedbed preparation for corn, weed control in growing corn, influence of tractor drive-wheel diameter on tractive efficiency, terrace construction methods and costs, utilization of clay products in farm building construction, soil erosion on Marshall silt loam, the relation of plant cover to erosion control, mechanical and acid treatment of hard-coated seeds of legumes useful in erosion control, and the direct-seeding method of establishing woody plants for erosion control.

[Agricultural engineering investigations by the Missouri Station], J. C. WOOLEY, M. M. JONES, and G. W. GILES (*Missouri Sta. Bul. 358* (*1935*), *pp. 32–36, figs. 2*).—The progress results are briefly presented of investigations on the effect of tillage methods on costs and yields of corn, corn planter fertilizer attachments, capacity of silos, a loafing barn for milk cows, and the grade in a fill above a soil-saving structure.

[Agricultural engineering investigations by the Texas Station], R. E. DICKSON, B. C. LANGLEY, D. SCOATES, H. P. SMITH, D. T. KILLOUGH, D. L. JONES, M. H. BYROM, B. H. HENDRICKSON, R. W. BAIRD, E. B. DEETER, and P. L. HOPKINS (*Texas Sta. Rpt. 1934, pp. 59, 60, 128, 129, 147–153, 175–178, 188–190*).—The progress results are briefly presented of investigations on run-off losses in relation to crop production and soil erosion, mechanical harvesting of cotton, and soil erosion investigations at Tyler, Temple, and Spur.

Surface water supply of the United States, 1934, Parts 8, 11, 12B (*U. S. Geol. Survey, Water Supply Papers 763* (*1936*), *pp. VI+188, fig. 1; 766* (*1936*), *pp. XI+364, fig. 1; 768* (*1936*), *pp. VII+202, fig. 1*).—These papers present the results of measurements of flow made on streams during the year ended September 30, 1934, No. 763 covering the western Gulf of Mexico basins, No. 766 the Pacific slope basins in California, and No. 768 the North Pacific slope basins—the Snake River Basin.

Daily river stages at river gage stations on the principal rivers of the United States, compiled by M. W. HAYES (*U. S. Dept. Agr., Weather Bur., Daily River Stages, 32* (*1934*), *pp. III+159*).—This volume contains data for 1934 (E. S. R., 73, p. 548).

Irrigation wells (*New Mexico Sta. Rpt. 1935, pp. 53–58, figs. 4*).—The progress results are briefly presented as to the construction of a number of additional wells.

Characteristics of cohesionless soils affecting the stability of slopes and earth fills, A. CASAGRANDE (*Jour. Boston Soc. Civ. Engin., 23* (*1936*), *No. 1, pp. 13–32, figs. 5*).—In studies conducted at Harvard University, the results showed that every cohesionless soil has a certain critical density, in which state it can undergo any amount of deformation or actual flow without volume

change. The density in the loose state of many cohesionless soils, particularly medium and fine uniform sands, is considerably above their critical density. Such materials in their loose state tend to reduce their volume if exposed to continuous deformation. If the voids are filled with water and the water cannot escape as quickly as the deformation is produced, then a temporary transfer of load on to the water takes place, and the resulting reduction in friction impairs the stability of the mass, which can lead in extreme cases to a flow slide. If a cohesionless soil is below the critical density, then it can stand any disturbance without danger of a flow slide. Whenever there is any tendency for the mass to deform, the water in the voids has a restraining influence. Many coarse-grained and very well graded mixtures of cohesionless soils are in their loose state approximately at the critical density. This fact, combined with their large permeability, renders them relatively stable against any disturbances, even in the loose state. Cohesionless soils in a state above the critical density can be efficiently compacted, and thereby stabilized against any disturbances, by means of special vibration machinery.

[Soil erosion investigations by the South Carolina Station], T. C. PEELE (*South Carolina Sta. Rpt. 1935, pp. 25–28, figs. 2*).—This progress report of investigations conducted in cooperation with the U. S. D. A. Soil Conservation Service includes studies of the physical properties of the different soil types of the Piedmont Plateau Region of South Carolina, with particular reference to the properties which indicate their erosive characteristics and the influence of cover; the effect of a soil mulch on erosion; and the concentration of soil in run-off water from terraced areas.

Pacific Northwest Soil Erosion and Moisture Conservation Experiment Station, C. E. DEARDORFF ET AL. (*Washington Sta. Bul. 325 (1935), pp. 68–74*).—The progress results are briefly presented of experiments on vegetative control of erosion, terracing, tillage for erosion control, gully control, forage crops and mixtures of grasses and legumes for erosion control, wind erosion, soil moisture, strip cropping, soil building rotations for erosion control, and utilization of clay points by planting to timber cover. This work is cooperative with the U. S. D. A. Soil Conservation Service.

Soil blowing and its control in Colorado, J. F. BRANDON and A. KEZER (*Colorado Sta. Bul. 419 (1936), pp. 20, figs. 12*).—It is pointed out in this bulletin that soil-blowing control is incident to and bound up with the breaking up of the ground-line sweep of the hard, driving winds of the winter-spring period. The best soil-blowing protection is a well-anchored, dense cover of dead or dormant vegetative matter. Necessary summer cultivations should not unduly fine the surface soil. A flocculent condition of the surface soil is difficult to recreate, once it has been destroyed by grinding, pulverizing implements. Cultivation to control soil-blowing spots should not only create furrows but should go deep enough into the hard, tight subsoil to lift clods to the surface. Cultivation which only moves loose blow soil is not effective as erosion control. Furrows intended to break up a blow spot must be not only deep enough to lift clods to the surface but must be so close together that the soil blown from between will not ride over. The fountainhead of any soil-blowing stream can be broken up by roughening the surface by means of furrowing implements that penetrate deeply enough to lift flocculent, cloddy soil to the surface. These may eventually be eroded down into blow soil and the furrows leveled, in which case the middles must be broken, raising another lot of clods to the surface.

A blow condition never corrects itself nor stays confined to one spot. The sweep of soil particles tends to weather down and to set in motion any and all soils in its path, no matter how blow-free they may be within themselves.

Blow spots must be worked. Nothing is more essential in a blow-control program for any region.

Vine-mesquite for erosion control on southwestern ranges, B. A. HENDRICKS (*U. S. Dept. Agr. Leaflet 114 (1936), pp. 8, figs. 4*).—Practical information on the subject is presented.

Public Roads, [February 1936] (*U. S. Dept. Agr., Public Roads, 16 (1936), No. 12, pp. 249–268+[2], figs. 18*).—This number of this periodical contains the current status of Federal-aid highway projects, U. S. Public Works program highway and grade-crossing projects, and U. S. Public Works road construction, all as of January 31, 1936, and an article entitled A Method of Predicting Settlement of Fills Placed on Muck Beds, by F. A. Robeson (pp. 249–266).

An introduction to structural theory and design, H. SUTHERLAND and H. L. BOWMAN (*New York: John Wiley & Sons; London: Chapman & Hall, 1935, 2. ed., pp. XI+318, figs. 189*).—In this, the second edition of this book, a more complete presentation of the basic elements of these methods is made.

The section on moment distribution has been rewritten, presenting a new statement of the principles involved, with a consideration of 1-story structures transversely loaded. It has become evident that the most efficient of all methods for the analysis of secondary stresses is moment distribution, and a complete statement of this application of the method has been added. Also, a section has been added describing the column analogy, a simple method of dealing with arches, tunnel rings, and single-span structures with end restraint.

Small sawmill improvement, C. J. TELFORD (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab., 1935, pp. 3, pl. 1*).—Practical information is presented in mimeograph form.

Box-testing equipment (*Jour. Min. Agr. [Gt. Brit.], 42 (1935), No. 4, pp. 316–318, pl. 1*).—Equipment for testing packing cases, wooden boxes, and fiber containers, by stresses similar to those experienced in road and rail transport, is described as installed at the Forest Products Research Laboratory in England.

The equipment provides for endurance and strength tests of the boxes and of the material employed in their construction. The principal endurance test is furnished by a large rotating drum, 8 ft. in diameter, revolving twice a minute. The box to be tested is placed in the drum, which can take cases of a size up to a 2-ft. cube. As the drum revolves, wooden baffles on its inner face catch the box under test and roll it over, so that it falls on its edges, corners, and faces, in turn. A moderately well-made wooden container has been found to open up after about 30 falls, but one really well-designed has withstood 150 or more falls. In this manner the hazards of modern transport are simulated, and a technic has been developed by which the stability of packing cases of new design can be compared with those whose strength has been established under actual use.

The resistance of a case to more drastic treatment is tested by a "dropping" machine, in which the case is made to fall from a height on to a steel plate. This machine is also designed so that the case can be dropped on a face, corner, or edge, at will.

A third piece of testing equipment is a crushing machine, by which compressive stresses can be applied to the opposite faces or corners of the box. This determines the resistance of the container to crushing when stacked in storage or during transit, and is of particular value for testing fiberboard containers, their rigidity during storage being of special importance. The utility of the machine was shown in some preliminary experiments on the strengthening of a wooden packing case by the addition of wooden battens. One type of

case opened up under a pressure of 550 lb. applied at the ends. When, however, battens were put around the ends it withstood a pressure of 1,000 lb., and with the further addition of battens around the four sides the case did not give way until a pressure of 2,000 lb. had been reached.

Factors that influence the decay of untreated wood in service and comparative decay resistance of different species, G. M. HUNT (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab., 1935, rev., pp. 5*).—The heartwood of catalpas, practically all of the cedars, chestnut, southern cypress, the junipers, black locust, red mulberry, Osage-orange, redwood, black walnut, and Pacific yew are classed as durable even under conditions that favor decay. Similarly the heartwood of aspen, basswood, cottonwood, the true firs (not Douglas fir), and the willows, when used under conditions that favor decay, may be classed as low in decay resistance; while the heartwood of Douglas fir, red gum, western larch, chestnut oak, southern yellow pine, and tamarack may be classed as intermediate. The heartwood of dense Douglas fir, honey locust, white oak, and dense southern pine may also be classed as intermediate, but is nearly as durable as some of the species named in the high durability group. The heartwood of the ashes, beech, the birches, the hemlocks, sugar maple, the red oaks, and the spruces may be considered on the border line between the intermediate and nondurable groups and cannot with assurance be placed in either group.

Effect of extractive substances in certain woods on the durability of paint coatings, F. L. BROWNE (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab., 1935, pp. 7, pls. 2*).—Tests to determine the effect of extractive substances in certain woods on the durability of paint coatings are reported.

The general plan of these tests was to transfer the characteristic extractive substances of ponderosa pine, redwood, and southern cypress to parts of boards of a softwood lacking in characteristic extractives of its own, and then to test the durability of coatings of paint applied to both the treated and untreated parts of the boards. The wood chosen for the test panels was eastern hemlock. Each test panel was 18 by 72 in. in size, made up of four boards of nominal 0.5- by 6-in. bevel siding. Each panel was marked off into three test areas each 18 by 24 in., of which the center area was the control area of untreated hemlock for comparison and the left- and right-hand areas were treated with extracts from other woods. After such treatment the entire panel was then painted with three coats of one of the paints and was exposed on a test fence in the vertical position facing south to observe the relative durability of the coating over the three test areas.

Four paints were used. The extract of ponderosa pine made pure white lead paint slightly more durable at Madison, Wis., and Fresno, Calif., and exerted no noticeable effect at the other stations, while it impaired the durability of lead and zinc paint at Madison, Fargo, N. Dak., and Fresno, exerting no noticeable effect at Tucson, Ariz., and Washington, D. C. The evidence, therefore, is consistent with the view that the resin in the pines is responsible for the lower durability of paints containing zinc oxide on the pines as compared with the durability on softwoods of similar physical structure other than pines.

The extract of redwood improved the durability of white lead paint at Madison, Fargo, and Fresno and that of lead and zinc paint at Madison, Fargo, Tucson, and Washington, exerting no effects at the other stations. The fact that redwood holds paint longer than other softwoods of similar physical structure may therefore be attributed to a beneficial effect of some of the extractive substances present in redwood.

The extract of cypress improved the durability of white lead paint at Madison, Fargo, and Fresno, and exerted no effect at the other stations. It impaired the durability of lead and zinc paint at Madison, Fargo, Tucson, and Fresno.

but improved the durability at Washington. The evidence is in line with expectations as far as white lead paint is concerned but is anomalous in the case of lead and zinc paint.

The antagonistic effect of piny resin on paints containing zinc oxide was attributed to reaction between zinc oxide and the acids of rosin with resulting increase in the brittleness of the coating.

The paints dried as rapidly on the areas treated with the extracts as they did on the untreated control areas. On untreated hemlock and on hemlock treated with the extract of ponderosa pine the paints required only a few hours longer to dry than they did when applied to wood at approximately 11 percent moisture content and in a reasonably dry atmosphere. On hemlock treated with the extracts from redwood and cypress the priming-coat paints remained liquid for several days and the drying of subsequent coats was retarded very materially. Transfer of the extracts of redwood and cypress to hemlock therefore made the hemlock like redwood and cypress lumber with respect to the drying of paint.

Corrosion-protective value of electrodeposited zinc and cadmium coatings on steel, W. BLUM, P. W. C. STRAUSSER, and A. BRENNER (*Jour. Res. Natl. Bur. Standards* [*U. S.*], *16* (*1936*), *No. 2, pp. 185–212, figs. 8*).—Atmospheric exposure of plated specimens in six locations showed that in a rural or purely marine climate both zinc and cadmium coatings furnished better protection against the corrosion of steel than did nickel or chromium coatings of the same thickness, although the zinc and cadmium rapidly lost their luster. In an industrial atmosphere where sulfurous and sulfuric acids are present, both zinc and cadmium were attacked rather rapidly and the life was about proportional to the thickness. Under these conditions the cadmium coatings failed in about two-thirds of the time required for failure of zinc coatings of the same thickness. Zinc-cadmium alloys containing about 10 percent of cadmium were superior to either zinc or cadmium. Variations in the conditions selected for depositing the coatings did not have a marked effect on their protective value. Hot-dipped zinc coatings gave about the same protection as plated zinc coatings of the same thickness.

In accelerated tests, such as the salt spray or intermittent immersion in a solution of sodium chloride, the time required for failure of a zinc coating is about proportional to its thickness. Cadmium coatings last much longer than those of zinc in a salt spray, which is not, therefore, a true measure of their relative value in an industrial atmosphere.

The protective value of a zinc or cadmium coating depends principally upon its minimum thickness, which can be determined by dropping tests, microscopic measurements, and the chord method.

Utilization and cost of power on Mississippi and Arkansas Delta plantations, L. A. REYNOLDSON, W. R. HUMPHRIES, S. R. SPEELMAN, E. W. MCCOMAS, and W. H. YOUNGMAN (*U. S. Dept. Agr., Tech. Bul. 497* (*1935*), *pp. 47, figs. 10*).—This investigation was conducted cooperatively by the U. S. D. A. Bureaus of Agricultural Economics, Agricultural Engineering, and Animal Industry and the Mississippi and Arkansas Experiment Stations. It related to the use and cost of power on plantations in the Delta sections of Mississippi and Arkansas.

Of the 161 plantations surveyed, 65 were operated with general-purpose or row-crop-cultivating tractors and mules, 63 with mules alone, 19 with tractors of mixed types and mules, and 14 with ordinary (2- or 3-plow) tractors and mules. Mixed-tractor plantations averaging 1,806 acres were the largest and mule plantations with 941 acres were the smallest. For all plantations cropland averaged 74 percent of the total area and cotton occupied 75 percent of the cropped land.

On all general-purpose tractor plantations there was an average of 1,094 hr. of tractor work per year, on mixed-tractor plantations 1,853 hr., and on ordinary-tractor plantations 470 hr. Mules on mule plantations did an average of 112 10-hr. days work per year, on both ordinary- and mixed-tractor plantations 108 days, and on general-purpose tractor plantations 100 days. Mule hauling, including time for loading, unloading, and waiting, as at the cotton gin, required 2 3 hr. per mile. Motor-truck hauling required only 11 min. per mile. Man labor varied from 117.5 hr. per acre in cotton with general-purpose tractors to 190 hr. with mules. On 24 plantations, the drawbar requirements per acre of cotton produced principally with tractor power amounted to 6 tractor-hours and 4.1 mule-hours.

The average annual cost of using tractors, exclusive of the operator's labor, was 70 ct. per hour, based on an average of 705 hr. of operation. Power by general-purpose tractors cost 66 ct. per hour based on 733 hr.; by mixed-type tractors, 71 ct. based on 733 hr.; and by ordinary tractors, $1.04 based on 439 hr. of use annually. Fuel and lubricants constituted 41 percent, and depreciation constituted 36 percent, of the total tractor-operating cost. Repairs fluctuated with the age of the machines and ranged from 6 ct. per hour for general-purpose tractors to 19 ct. for ordinary tractors The average age of ordinary 2-plow tractors was 4 8 yr., 3-plow tractors 3.5 yr., and general purpose tractors 1 8 yr. The annual cost of using tractor-drawn implements ranged from $22 for middle busters to $64 for 4-row cultivators. The cost per hour of mule work was lowest, 12 5 ct., on mule plantations where mules worked 112 days, and it was the highest, 14 6 ct., on general-purpose tractor plantations where they worked 100 days.

The average yearly cost of motor-truck operation was 69 ct. per hour for trucks with trailers and 53 ct. for those without trailers. The average cost of power for all tractor plantations was $11.48 for each acre in cotton. Investment in power machinery for all tractor plantations averaged $4.24 per acre in cotton. The average cost of power on mule plantations amounted to $10.63 per acre in cotton. The cost of drawbar work on crops with mules and tractors ranged from $8 54 per acre in cotton on general-purpose tractor plantations to $10.40 on mixed-tractor plantations. On mule plantations, the cost was $8.64 per acre in cotton. Such costs per crop acre ranged from $6.47 on general-purpose tractor plantations to $7.29 on mixed-tractor plantations, and were $6.66 on mule plantations.

Electricity in the home and on the farm, F. B. WRIGHT (*New York: John Wiley & Sons; London: Chapman & Hall, 1935, pp. XIX+320, figs.* [234]).—This book is based on the author's work at Cornell University and is written for those who wish to gain a practical knowledge of electricity and its application in the home and on the farm. The book is divided into two parts.

Part 1 contains sections on electric circuits; the dry cell; doorbell circuits; switches; electric fuses; conductors and insulators; how to figure wire sizes for a given load; splicing conductors; extension cords; lamp sockets; trouble lamps; watt-hour meters; wiring systems for light, heat, and power; installing outlets; special circuits; transformers; electric motors; electric generators; electric heating appliances; and storage batteries.

Part 2 contains chapters on the nature of electricity, direct-current circuits, electrical terms and measurement, magnetism, electrical effects, electromagnetic induction and some of its applications, direct-current generators and motors, alternating currents, power transmission and distribution systems for alternating current, and alternating-current generators and motors.

The use of tillage machinery in soil-drifting areas, E. A. HARDY (*Soil. Agr., 16 (1936), No. 5, pp. 281–284, figs. 2*).—General information is given on the sub-

ject, emphasis being placed upon tillage practices which will produce a lumpy or cloddy condition of the soil which will resist wind action.

Care and repair of mowers and binders, W. R. HUMPHRIES (*U. S. Dept Agr., Farmers' Bul. 1754 (1936), pp. II+21, figs. 10*).—This bulletin is a revision of and supersedes Farmers' Bulletin 947 (E. S. R., 39, p. 292). It contains practical information on how to make needed repairs and adjustments in mowers and binders.

Effects of gin-saw speed and seed-roll density on quality of cotton lint and operation of gin stands, C. A. BENNETT and F. L. GERDES (*U. S. Dept. Agr., Tech. Bul. 503 (1936), pp. 40, pls. 3, figs. 18*).—Studies are reported, in cooperation with the Alabama, Georgia Coastal Plain, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia Experiment Stations and other agencies, the purpose of which was to determine the relative influence of gin-saw speed and seed-roll density on the quality of ginned lint and on the ginning capacity, power requirement, and energy consumption during ginning, and to show the losses in monetary value of the lint that may be associated with tight seed-roll ginning. Brush and air-blast gins were used.

The 98 especially selected American upland seed cottons employed in these tests were taken from the crop years of 1930, 1931, 1932, 1933, and 1934, and were grown in 11 States, from Virginia to Texas and Oklahoma. In moisture content they ranged from 6.8 to 20.2 percent, in staple length from $\frac{13}{16}$ to $1\frac{3}{32}$ in., and widely in other characteristics. The results of tests on lint quality are presented for 46 cottons, and of tests relating to lint turn-out, lint value, ginning time, power required, and energy consumed for from 9 to 57 cottons.

The results showed that lowering the gin-saw speed 100 r. p. m. below the manufacturer's recommended speed improved the quality slightly, but raising the speed 100 r. p. m. did not change the quality appreciably. Changes in seed-roll density caused by changes in the rate of feeding seed cotton to the gin stand are much more important than changes in gin-saw speed in affecting the quality of the ginned lint and the mechanical operation of the gin stand. Loose-roll ginning gave the better quality cotton.

The effects of variations in the method of ginning employed with a wide range of cottons were materially greater on the preparation component of grade than on any other quality element.

No real effect of gin-saw speed on staple length was found. As the seed-roll density was changed, the staple-length differences between loose- and tight-roll samples showed slight tendencies for the loose-roll samples to be classed longer. Laboratory determinations of the upper quartile length and of the variability of fiber length showed little relation of these elements to the gin-saw speed or the seed-roll density.

Grade differences due to variations in gin-saw speed averaged less than one-fifth of a grade improvement for the low speed. The change due to increasing the speed was negligible. Grade differences due to change in seed-roll density amounted to nearly two-thirds of a grade in favor of the loose roll.

Using prices for cotton of like grades and staples prevailing in the Memphis, Tenn., market during the 1932 crop season as a basis of monetary-value computations, the use of a loose seed roll instead of a tight seed roll with a group of cottons averaging $1\frac{1}{16}$ in. in staple length from seed cottons averaging 14.1 percent in moisture content showed net benefits of approximately $4.50 per bale, or 13 percent, and almost $1.50 per bale, or 4 percent, with a group of cotton averaging $1\frac{3}{32}$ in. in staple length from seed cottons having 10.2 percent moisture content. The amount of reduction in value as a result of using a tight seed roll for short-staple cottons (about 1 in.) from [illegible]

of relatively high moisture content and of substantially lower moisture content averaged 95 and 62 ct. per bale, respectively.

Ginning capacity and lint turn-out for the group of seed cottons giving 1 in. staple length and having 9.6 percent moisture content were generally slightly less with the low saw speed and often were greater with the high speed. Ginning capacity for an outfit of four 70-saw gins was increased 3 bales per 8-hr. day by increasing the gin-saw speed 200 r. p. m., and 11 bales by using a tight seed roll instead of a loose seed roll. Lint turn-out showed no definite or consistent relationship to seed-roll density.

Power requirement, though showing some tendency to increase with gin-saw speed, was not materially affected by changing the gin-saw speed 100 r. p. m. above or below the manufacturer's recommended speed. The power requirement was increased 50 percent, however, by varying the seed-roll density from loose to tight.

Energy consumption per unit weight of seed cotton ginned was not appreciably affected by variations in gin-saw speed or seed-roll density. The interrelationship of ginning time and power requirements caused the difference in energy consumption to be negligible, although indications were that for these small differences the high gin-saw speed and loose seed roll showed slight advantages.

Electric brooders on Indiana farms, T. E. HIENTON (*Indiana Sta. Circ. 187, 2. rev. (1936), pp. 4, figs. 2*).—Records of electric energy consumption of 66 brooders are reported and discussed (E. S. R., 73, p. 257).

Electric energy consumption per chick raised varied from less than 0.25 to more than 1 kw.-hr., due to differences in mortality, numbers of chicks brooded, and other factors. Utilizing a brooder to its capacity reduces the consumption per chick raised.

Data on chick mortality in electric brooders also are included.

North Carolina farm housing, E. W. STEVENS and H. ESTABROOK (*North Carolina Sta. Bul. 301 (1935), pp. 82, figs. 10*).—The results of a study made by the station in cooperation with the North Carolina Department of Agriculture are presented which involved a house-to-house survey of 28,205 farm houses in 10 areas of the State selected to cover all types of farm life.

It was found that 95 percent of all farmhouses were frame. Only 36 percent of all farmhouses have ever been painted, and only 7.3 percent have paint in good repair. Seventy percent are one-story.

The condition of 11 structural items was rated by the enumerators as good, fair, or poor. Fifty-two percent of all houses had no screens, 17 percent had poor screens, 18 percent fair, and only 13 percent had good screens. Percentages of other items rated good came to 28 percent of all foundations, 24 of all doors and windows, 33 of all roofs, 24 of all floors, and 17 percent of interior walls and ceilings. Only 2.5 percent of the houses were listed as having any kind of insulation. Enumerators judged the following percentages of houses to be unfit for human habitation and that the cost of repair would be greater than cost of replacement: 4 percent of the houses occupied by white owners, 5.5 occupied by white tenants, 7.2 occupied by negro owners, and 8.6 percent occupied by negro tenants. Two-thirds of all North Carolina farmhouses have no provisions for storing fruits and vegetables.

Three-fourths of white owners had living rooms, but only half of the white tenants, half of the negro owners, and less than a third of the negro tenants. Somewhat lower percentages in each group had dining rooms. Over 40 percent of all houses and over 30 percent of white-owner houses had no closets.

Over three-fourths of all farm families surveyed carried their water, and only 11 percent had a kitchen sink with drain. Half of the houses surveyed

got their water from dug or bored wells, a fourth from drilled or driven wells, almost a fifth from springs, and only 0.2 percent from cisterns. One hundred and eighty families were getting their water from streams, and 213 had no source of water on the premises. One out of 5 wells needed repairs and 1 out of 7 should be abandoned.

Over half of all families were using unimproved privies, 11 percent were using improved privies, 3 percent were using flush toilets, and 0.1 percent chemical toilets. A full third of all farm families were found with no toilet facilities whatever. Among white owners, 27 percent had no toilet facilities Of all the families, 5.8 percent had bathrooms, 3.2 percent had bath tubs, and 3 percent had lavatories.

The number of families with labor-saving conveniences was very small. A total of 9.5 percent of all families had electric lights—17.8 percent of white owners. Less than 2 percent of all families and less than 3 percent of white owners had either a circulating heater or furnace. Only 7.4 percent of all families had some kind of improved cook stove, either kerosene, gasoline, gas, or electric—usually kerosene—while 1.8 percent had power washing machines and an equal number had hand washing machines. Most of the laundry is done outdoors. A fifth of all families had ice refrigerators, and only 1.1 percent had mechanical refrigerators—2.5 percent of white owners.

Few significant trends toward better housing were found when a sample of houses under 10 yr. old was compared with a sample from 25 to 49 yr. old.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the Iowa Station, 1934–35] (*Iowa Sta. Rpt. 1935, pp. 16, 17, 20, 21, 23, 24–26, 28, 32, 33, figs. 2*).—Results of investigations not previously noted are reported as follows: A map, by T. W. Schultz and A. G. Black, showing the prices of corn 1931–32 by farming areas of the State; some findings as to cash receipts and net farm income, by J. A. Hopkins, C. C. Culbertson, H. R. Meldrum, and R. Beresford, in a study of farm organization and management in southern Iowa, and as to corn yields and net income 1933–34 in the State, by Hopkins; some data, by I. W. Arthur, regarding livestock on farms October 1934, and farm supplies of livestock feeds; findings, by H. M. Hamlin, as to savings that would result from the consolidation of rural schools in 33 counties, and by Hopkins, L. G. Allbaugh, and D. E. FitzGerald, as to the effects of the corn-hog program on Iowa farm organization and management; a chart, by Schultz and Black, showing by quarter-years 1930–34 the Cuban imports of U. S. lard, and the Cuban tariff barriers; and a statement, by Schultz, of some of the important characteristics of the sugar beet crop as grown in Iowa.

[Investigations in agricultural economics and farm mangement by the Missouri Station, 1933–34] (*Missouri Sta. Bul. 358 (1935), pp. 27–31, fig. 1*).—Results of investigations not previously noted are reported as follows: Some findings as to farm management adjustments to changing prices in a study made by O. R. Johnson and B. H. Frame of 30 farm account records and 265 survey records from Nodaway, Atchison, and Linn Counties; findings by Frame as to the amounts of man labor and horse and tractor work used in 1929 in growing and harvesting corn in Carroll, Atchison, Bates, and Vernon Counties, and the contribution of the farm to family living expenses on 85 Atchison, 55 Nodaway, and 75 Linn County farms; findings by Johnson and Frame as to average labor income of owners operating no additional land, owners renting additional land, and tenants; and a chart prepared by C. H. Hammar showing acreages of Missouri land in different uses.

[Investigations in agricultural economics by the New Mexico Station, 1934–35] (*New Mexico Sta. Rpt. 1935, pp. 11–13*).—Included are tables showing (1) the cost in 1933 per acre, total and for power and lubricating oil, of irrigating each of the principal crops in the Deming area of the State; (2) the yield and cost of growing and harvesting the principal fruits and vegetables during the 1934 crop year, and the prices received in San Juan County in 1934 for different varieties of apples; and (3) the total assessed acreage of agricultural and grazing land in 8 New Mexico counties and the acreage delinquent on 1932 tax levies.

[Investigations in agricultural economics by the South Carolina Station, 1934–35] (*South Carolina Sta. Rpt. 1935, pp. 8–17, 73–75, figs. 4*).—Results of investigations not previously noted are reported on. Included are the relations of the sales prices of 12,230 farms in 31 counties grouped by sales price to assessed value, found in a study by G. H. Aull and E. Riley in cooperation with the Bureau of Agricultural Economics, U. S. D. A.; further findings by Aull and Riley, as to real estate tax deliquency, in a more detailed analysis of the data previously noted (E. S. R., 72, p. 270); some preliminary findings in a farm business and type-of-farming study, by J. L. Fulmer; findings as to the receipts, expenses, income, return on investment, size of farm, enterprises, yields per acre of crops, prices for cotton and tobacco, etc., on 98 farms, 32 typical farms of the number, and the 8 best farms, in a study by M. C. Rochester in cooperation with the Bureau of Agricultural Economics, U. S. D. A., of farm organization, practices, and readjustments in selected areas of the State; a chart by M. Guin showing the average corn acreage and production and number of hogs on South Carolina farms 1910–34; a table by H. A. White and Guin showing the percentage distribution of staple length of American upland cotton ginned in South Carolina from the 1928–34 crops; and a comparison by C. S. Patrick of the total cost of harvesting with 6- and 10-ft. binders and stationary separators and with combines, and of cutting corn by hand and with corn binders.

[Investigations in agricultural economics by the Texas Station, 1933–34] (*Texas Sta. Rpt. 1934, pp. 101, 102, 105, 106, 108, 109*).—Results of investigations not previously noted are reported on as follows: Findings, by C. A. Bonnen, in a study made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., as to net earnings 1931–33 on high- and low-profit farms in the high plains cotton area of Texas; findings, in a study by W. E. Paulson, of quality as a factor in the marketing of vegetables in the Lower Rio Grande Valley of Texas; findings, by Paulson, G. S. Fraps, and R. T. Stewart, in a study of central and local market prices of wheat in relation to quality; and findings, by L. P. Gabbard, of the changes in farm real estate taxes in the State for the period 1913–32.

[Outlook charts] (*U. S. Dept. Agr., Bur. Agr. Econ., 1935, [1], pp. [4]+30, figs. 30; [2], pp. [4]+31, figs. 31; [3], pp. [4]+20, figs. 20; [4], pp. [5]+43, figs. 43; [5], pp. [3]+15, figs. 15; [6], pp. [6]+53, figs. 53; [7], pp. [4]+27, figs. 27; [8], pp. [4]+29, figs. 29; [9], pp. [4]+32, figs. 32; [10], pp. [4]+29, figs. 29; [11], pp. [4]+31, figs. 31; [12], pp. [4]+27, figs. 27; [13], pp. [3]+19, figs. 19; [14], pp. [4]+23, figs. 23; [price list], pp. 40*).—This series of charts for use with the agricultural outlook for 1936 previously noted (E. S. R., 74, p. 554) includes books of charts on (1) demand, credit, prices, (2) feed crops (corn, oats, barley, hay), total livestock, (3) flax, soybeans, peanuts, and cottonseed, (4) potatoes and truck crops, (5) rice, dry beans, and broomcorn, (6) fruits—apples, citrus, peaches, etc., (7) beef cattle, (8) sheep, lambs, and wool, (9) dairy products, (10) poultry and eggs, (11) cotton, (12) wheat and rye, (13) tobacco, and (14) hogs. A price list of charts on different com-

modities and farm family living for use in local outlook meetings and for outlook analysis is also included.

Part-time and garden farming in Iowa, R E WAKELEY (*Iowa Sta. Bul. 340 (1935), pp 19–63, figs. 12*).—This study was based upon information obtained for 959 part-time farm operators around 10 cities in 10 counties of the State.

Some of the findings were as follows: Two-thirds of the families were of American parentage. A large percentage of the people included were between 35 and 55 yr. of age, and a very small number were under 5 yr. of age. As to modern conveniences, part-time farmers ranked only slightly above rural farmers and somewhat below city averages. The average distances to schools were—elementary less than 1 mile, high schools 2¼ miles. Part-time farming areas were found to be unorganized. Nonagricultural income averaged $700 per family. Twenty percent of the families were receiving relief aid. The income from agriculture averaged $129.70 for the families on relief, and $196.70 for those not on relief. Approximately 39 percent of the agricultural income was derived from dairy products, 16 percent from poultry, 11.5 percent from other livestock, 6 percent from fruits, 10 percent from vegetables, and 6 percent from fuel. There were 5.5 percent of the families that had net operating incomes of over $400, 27.1 percent from $101 to $400, 38 8 percent $100 or less, 23.9 percent from —$1 to —$199, and 4.9 percent from —$200 to —$800.

Analysis is also made of the size and composition of families, school attendance, rent paid, size of farms, value of lands and buildings, opinion of operators regarding part-time farming, and other factors.

Graphic summary of agriculture and land use in Oregon, H. D. SCUDDER and E. B. HURD (*Oregon Sta. Circ. 114 (1935), pp. 39, figs. 58*).—This is a preliminary issue of selected maps and graphs on topography, temperature, precipitation, various economic factors, crop acreages, yield, etc., and range lands, game reserves and numbers, etc, of range livestock.

Land economic survey of Hubbard County, Minnesota (*Minnesota Sta. Bul. 317 (1935), pp. 264, pls. 2, figs. 69*).—This is a report on a survey made in cooperation with the Minnesota Department of Conservation under the act of the Minnesota legislature approved April 19, 1929 Included are a general description of the county, and chapters on its history, soils, and forests, primary land use, recreational uses of the land, types of land ownership, public services and improvements, and taxation of the land, the association of tax delinquency and mortgage indebtedness with soil type, and taxes and land use. An appendix describes the methods used in this survey.

It is recommended that (1) the State retain lands now owned by it, except those well adapted for agricultural or other private use; (2) legislation be enacted authorizing counties to zone lands; (3) settlers on land not well suited for agriculture, or where the cost of providing them with schools, roads, and other necessary public services are unnecessarily high because of isolated location, be assisted in relocating; (4) the policy of bargain settlement of taxes be discontinued, land definitely tax-delinquent be retained and developed in State ownership, and the laws regarding reversion of delinquent lands be amended to give the State clear title; (5) the boundaries of State parks and forests be extended to include lands not suitable for agriculture and tax-delinquent lands, and intensive forest management be practiced only on lands well suited for forestry development; (6) careful attention be given to reforestation, water-level control, and game preservation to maintain and expand recreational opportunities; and (7) legislation be enacted authorizing counties to adjust their governmental machinery to their needs.

The farm real estate situation, 1934–35, B. R. STAUBER and M. M. REGAN (*U. S. Dept. Agr. Circ. 382 (1935), pp. 52, figs. 8*).—This is a continuation of the study previously noted (E. S. R., 73, p. 860).

The index of estimated average value per acre of farm real estate rose 3 points during the year to 79. Thirty States reported increases, and 5 decreases. The indexes of 4 New England, 1 Middle Atlantic, 4 Southern, and 1 Pacific Coast States were higher than the prewar basis. In 8 States, principally New England and the South, values were not less than 90 percent of the prewar base, while in the North Central States the average was approximately two-thirds of the prewar values. The ratio of prices received to prices paid by farmers for commodities averaged 73 in 1934 and 85 for the first 7 months of 1935 as compared with 64 in 1933. Gross income from farm production, not including rental and benefit payments, increased approximately $600,000,000 over that in 1933, but even with the rental and benefit payments included was only approximately two-thirds of the average for the period 1922–29. The changes of ownership due to difficulties connected with debt decreased from 28 to 21 per thousand of all farms, the decreases occurring in nearly all States. Changes due to failure to pay taxes decreased from 11.1 to 7.3 per thousand of all farms.

"The continuation of the refinancing, interest reduction, and debt-adjustment program inaugurated by the Farm Credit Administration following its organization in May 1933 has been an extremely important factor during 1934 in contributing toward the improved situation. . . . The Federal land banks and the Farm Loan Commissioner continued as the principal sources of farm-mortgage credit during the first quarter of 1935. They advanced 51 percent of the total of farm mortgages recorded during that period, as compared with 65 percent during the last quarter of 1934 and 77 percent during the first quarter of 1934. . . . During the first quarter of 1935, life insurance companies increased their mortgage recordings 60 percent over the first quarter of 1934; banks and trust companies increased theirs 53 percent, and individuals, 18 percent; but the mortgage recordings of mortgage companies decreased 30 percent."

Valuation of real estate with special reference to farm real estate, compiled by M. T. OLCOTT and H. E. HENNEFRUND (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 60 (1935), pp. V+350*).—This bibliography of 1,132 titles, which supersedes that previously noted (E. S. R., 62, p. 782), includes annotated references on rural valuation and valuation of farm buildings, forests and woodlots, orchards, irrigated land, urban properties, buildings, and railroad and public utility lands, and on natural resources, land valuation short courses and conferences, assessment for taxation, appraisers' and assessors' manuals, maps, valuation in foreign countries, and theses on real estate valuations.

Tax delinquency in Maryland, with special reference to agriculture, W. P. WALKER and A. B. HAMILTON (*Maryland Sta. Bul. 381 (1935), pp. 155–185, figs. 2*).—This bulletin presents the results of a study made of county records in 1934 in cooperation with the Bureau of Agricultural Economics, U. S. D. A., on CWA funds, and discusses the problems of tax collection procedure in Maryland counties. Analysis is made for the years 1928–32 of the amounts and trends of tax delinquency, acres delinquent, additional tax burden due to delinquency, tax sales, etc. The factors associated with delinquency—collection procedure, discounting of payments, farm prices and income, size of holdings, etc.—are discussed.

The amount of farm real estate taxes outstanding increased $1,504,204 from 1928–29 to 1932–33. The number of properties delinquent increased 5,858 (approximately 52 percent), the acreage delinquent increased 597,517 acres (ap-

proximately 68 percent), and the number of farm properties sold for taxes increased from 44 to 511.

Some of the conclusions and recommendations were as follows: There is a tendency for marginality of land and tax delinquencies to be related, but farm tax delinquency is not necessarily a direct reflection of marginality of land. Prompt payment of taxes may be encouraged by provisions for installment payments, discounts for early payments, closer agreement between periods of payment and periods of cash income of taxpayers, and by making tax sales a more definite and consequential circumstance.

Constitutionality of State income and classified property taxes, G. S. KLEMMEDSON (*Colorado Sta., 1935, pp. [2]+54*).—This mimeographed publication consists of a brief on the constitutionality of a State income tax under the usual uniformity clause of State constitutions, a digest of State constitutional provisions, with special reference to the uniformity clause, the text of income tax amendments to the constitutions of different States, and a discussion of the power to classify property for the purposes of taxation.

Milk-production costs in West Virginia, L. F. HERRMANN, R. O. STELZER, and G. A. BOWLING (*West Virginia Sta. Bul. 268 (1936), pp. 32*).—Data were gathered for 24 farms selling milk in Morgantown for the year beginning April 1, 1934, and 27 farms selling in Fairmont for the year beginning May 1, 1934. The organization of farms, cropping practices, yields, and other factors are analyzed and discussed.

The net costs per cow and per 100 lb. of milk were $111.85 and $2.15, respectively, in the Morgantown area, and $96.79 and $2.14, respectively, in the Fairmont area. Feed and labor costs were $74.80 and $24.74, respectively, in the Morgantown area, and $67.94 and $22.95, respectively, in the Fairmont area. Prices received for milk in either area were sufficient to cover the costs of production. Some suggestions are made that would result in lower costs of production after one or more years, including a greater use of legume hays, the use of good registered bulls, and greater care in regulating grain feeding according to milk production. The use of milking machines saved 50 hr. labor at a cost of $3.24.

Home-grown roughage and milk production costs, J. L. TENNANT (*Rhode Island Sta. Bul. 254 (1936), pp. 28, figs. 4*).—"The purpose of this study is to present some suggestions whereby the feed cost of producing milk on Rhode Island dairy farms may be reduced."

Tables are included and discussed showing the acreage of land, total and tillable, and the number of cows per farm, the acres of tillable land per animal unit eating roughage and per cow, all feed and cash crops and open pastures on farms grouped by size of the milking herd, and on the basis of whether 90 percent or over, 50 to 89 percent, and 25 to 49 percent of the cash receipts were from the dairy herd. The reduction of feed costs by use of more roughage and less grain, improvement of pastures, increasing yields of roughage crops, the use of manure, production of better hay, and double cropping are discussed.

It is concluded that "under Rhode Island conditions the possibilities of replacing part of the grain with home-grown roughage are limited and will pay only when such a practice increases the net returns of the farm."

Freight costs of moving Iowa feed grains from surplus to deficit areas, R. C. BENTLEY (*Iowa Sta. Bul. 342 (1936), pp. 113–148, figs. 8*).—Charts are included and discussed showing the local freight rates to Cedar Rapids, Des Moines, Council Bluffs, Sioux City, Clinton, Davenport, and Keokuk, the interstate or through rates to Chicago, Ill., Milwaukee, Wis., Peoria, Ill., St. Louis and Kansas City, Mo., Omaha, Nebr., and Minneapolis, Minn., and the proportional or joint rates to Minneapolis, Omaha, and Kansas City.

An economic analysis of local grain elevators in Indiana, A. F. HINRICHS (*Indiana Sta. Bul. 403 (1935), pp. 32, figs. 12*).—This bulletin is based upon data for the crop years 1928–32, gathered by annual personal visits to 79 farmers' elevators and independent elevators. Of the number 46 were grain elevators—value of sales of grain exceeded that of sideline sales, and 33 sideline elevators—value of sideline sales exceeded that of grain sales. The data are analyzed with a view to ascertaining the composition and volume of business, the important factors affecting gross income, and the relation between each important cost factor and volume of business and net income. Some of the findings were as follows:

Ten of the grain elevators had an average annual net income of $4,057, while ten of the sideline elevators showed an average annual net loss of $1,559. The grain elevators were more efficiently operated, the average gross income being $798 less, and the net income $1,139 more than that for the sideline elevators. Farmers patronizing successful elevators tended to receive the maximum prices for grain and pay the minimum prices for sideline purchases. Volume of business is the most important accounting for variations in the efficiency of operation, such efficiency increasing rapidly until $120,000 worth of business was done. Labor and management constituted nearly 50 percent of the operating costs, and full utilization of these is the easiest way to increase operating efficiency. The success of most elevators is more dependent on the solving of internal problems than on external problems.

Financing American cotton production and marketing in the United States, compiled by M. C. BENTON (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 61 (1935), pp. [1]+II+45*).—This bibliography covers the period 1897–1935, and includes 229 annotated references to periodicals and books relating to all phases of financing of American cotton from production through marketing.

Costs, income and financial status of cooperative gins of Texas, season 1933–34, W. E. PAULSON (*Texas Sta., 1935, pp. [2]+33, figs. 12*).—This mimeographed preliminary report is based on data for 72 cooperative gins. Special emphasis is placed on business organization during the 1933–34 cotton season. Tables are included and discussed showing the date and type of organization, volume of business, cost of ginning, relation of fixed and operating costs, income and its distribution, accounts receivable, and similar matters.

Cotton marketing practices in North Carolina, G. R. SMITH (*North Carolina Sta. Tech. Bul. 51 (1935), pp. 46, figs. 14*).—This bulletin reports the results of a study made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., and based on data obtained from various types of local cotton buyers and 627 gins. The general factors affecting the producing area are described. The types of local buyers, their methods of determining prices, trading practices and selling practices, etc., and the volume of ginnings, importance, sources, size of purchases, buying practices, sources of income, classing practices, movement of cotton, etc., of ginner buyers are discussed.

The factors having an important influence on local marketing practices were found to be proximity of buyers to mills and export markets, contacts of local buyers with mills and cotton merchants, importance of cotton as a crop in the community, types of farming and sizes of farms, grade and staple of cotton grown and the variations in grade and staple lengths, the volume of local buyer purchases, inability on the part of both buyer and farmer to classify cotton accurately, established trading practices, credit facilities of farmers and local buyers, and the economic dependence and independence of producers.

Suggestions are made for the improvement of practices, classifying, determining price differentiations, cooperative marketing, reduction in the number of markets, etc.

Cotton production in northeast Brazil, P. K. NORRIS (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Agr. Serv., F. S. 64 (1935), pp. 22, figs. 4*).—This mimeographed report is based on field investigations made by the author in 1934.

Production, marketing, and consumption of Maryland tobacco, R. HUBLEY and S. H. DEVAULT (*Maryland Sta. Bul. 382 (1935), pp. 187–289, figs. 9*).—The history of tobacco production in the State, farm organization, farm tenure, soils, production practices, etc., are described. The costs of production and marketing are analyzed. Marketing practices, methods of sale, and distribution and consumption of Maryland tobacco in the United States and foreign countries are discussed.

Detailed cost records for the years 1928 and 1931 were secured from approximately 60 tobacco growers in each of the 5 most important tobacco-growing counties of the State. Data were also obtained from tobacco farmers as to acreage and production of crops grown, livestock, amounts of man labor and horse work required for different operations in growing and marketing tobacco, value of tobacco land, value of the barns, sticks, and prizes, etc. Data on assessments and taxes were obtained from county records, and on sales, marketing, uses, distribution, etc., from selling agents and State and Federal agencies.

The average cost of producing and marketing tobacco was $133.24 per acre and 19.2 ct. per pound in 1928, and $124.74 and 15.8 ct., respectively, in 1931. Charges for man labor constituted more than ⅜ of the costs, barns, sticks, and prizes more than ⅛, and horse work more than $\frac{1}{10}$. The average amounts a man and horse worked per acre were 24 and 8.6 10-hr. days, respectively, in 1928, and 27 and 9.1 days, respectively, in 1931. The farms with the highest profits per pound had yields per acre approximately 66 percent greater than those on the lowest profit farms. The cost per pound 39 percent lower received an average price per pound almost 300 percent higher, used 28 percent more fertilizer per acre, and 36 percent less man labor in replanting, the proportion of "crop" tobacco was 200 percent greater, and the crop of tobacco sold for an average of 100 percent more.

Recommendations are made as to growing, curing, grading, and marketing practices, the establishment of cooperative packing plants, State supervision of sampling, State reports of sales and resales, and related matters.

Some economic aspects of regulating shipments of California oranges, H. R. WELLMAN (*California Sta. Circ. 338 (1936), pp. 29, figs. 14*).—"The purpose of this circular is to present in nontechnical form the results of an analysis of the major factors which have influenced the seasonal average f. o. b. prices of California oranges and the application of the results to the problem of estimating the effects upon returns to growers of regulating the volume of orange shipments."

It is concluded that the seasonal average f. o. b. prices of California oranges are affected by the volume shipped, the quality, the trend in demand for oranges, the volume of competing products, the buying power of consumers, and the confidence of the trade in the stability of orange prices. The volume shipped and the confidence of the trade in the stability of prices can be influenced by regulation of shipments. In seasons of large crops relative to buying power of consumers, prices and returns for summer oranges can be materially increased by the limitation of the volume of shipments. The possible increase is much less in the case of winter oranges. In the case of both sum-

mer and winter oranges, the market can be stabilized by regulation of the flow of shipments from the State. Limitation of shipments for the season as a whole is a device to be used intermittently, but regulation of flow of shipments during the season without actual limitation of total supply is a device to be used continuously. Limitation of total supply will be beneficial in years of acute emergency situations, that is, when rates to growers would otherwise be at disastrously low levels. Regulation of flow of shipments will prove beneficial under nearly all conditions.

Economic study of absentee ownership of citrus properties in Florida, H. W. HAWTHORNE and J. E. TURLINGTON (*Florida Sta. Bul. 287 (1935), pp. 32, fig. 1*).—This partial report of a study made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., is based principally on answers of 477 absentee owners to a questionnaire asking for data for the years 1924–25 to 1929–30 on costs of operation and development and receipts from groves, age of trees, plantings, terms of purchase, method of taking care of groves, harvesting and marketing fruit, cost of groves, and other data.

A method of analyzing the effectiveness of local livestock cooperatives in selling hogs, S. H. THOMPSON and P. L. MILLER (*Iowa Sta. Res. Bul. 193 (1936), pp. 33–70, fig. 1*).—This bulletin is based upon a study of the records for 1931 of four cooperative livestock marketing associations as to markets used, date of sales, number, classes, and market weights of hogs sold, prices, returns, transportation, marketing expenses, shrinkage, and other factors. Analysis is made of the effectiveness of selling operations and the choice of place and time of marketing. An appendix includes a description of the methods of determining shipping margins, the variations in and the adjustments of such margins, shrinkage, and the adjusted cost of shrinkage.

Livestock financing in the United States: Selected references to material published 1915–1935, compiled by K. JACOBS (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 62 (1935), pp. [3]+57*).—This mimeographed list of 300 selected references supersedes the list previously noted (E. S. R., 54, p. 80).

Financing cooperative marketing of farm products in Washington, E. F. DUMMEIER (*Washington Sta. Bul. 322 (1935), pp. 63*).—This study of the approximately 170 cooperative organizations of farmers in the State designed primarily for marketing farm products was made to ascertain the amount of financing necessary, both absolute and in relation to volume of business, the most successful and unsuccessful methods of operating such organizations, and the part that has been taken in financing, marketing, and production by the semi-cooperative and cooperative financial agencies supervised or administered by the Federal Farm Credit Administration. The organizations for marketing dairy products, grain, fruit, apples, berries, vegetables, etc., are listed and described.

The organizations in 1934 had over 40,000 members, and their total business amounted to over $50,000,000. Total assets were more than $20,000,000, of which slightly less than 50 percent was fixed assets and approximately 50 percent current assets. Of the total investments more than 60 percent were those of members, and the balance investments by creditors. Borrowing of over 50 percent of the total assets was found not to be desirable. The essential factors in successful financing and operation were found to be adequate volume of business, operations so conducted that an improved product of highly standardized quality will be furnished, economical operation, intelligence and effectiveness in selling, adequate and accurate accounting system, adherence to the principles required to be observed in order to be recognized as a cooperative association under the Capper-Volstead Act and by the Farm Credit Administration, and a

solid financial program, including a substantial investment by members and a financial interest in the association by its entire membership.

Farm prices of cotton related to its grade and staple length in the United States, seasons 1928–29 to 1932–33, L. D. HOWELL and J. S. BURGESS, JR. (*U. S. Dept. Agr., Tech. Bul. 493 (1936), pp. 63, figs. 8*).—The results are presented of a study made in cooperation with the Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas Experiment Stations. Results for individual States have been previously noted as follows: Alabama (E. S. R., 66, p. 682), Arkansas (E. S. R., 68, p. 117), Georgia (E. S. R., 64, p. 786; 69, p. 605), Louisiana (E. S. R., 65, p. 484), Mississippi (E. S. R., 70, p. 410), North Carolina (E. S. R., 72, p. 124), Oklahoma (E. S. R., 72. p. 553), South Carolina (E. S. R., 70, p. 120), and Tennessee (E. S. R., 72, p. 407).

Prices in local markets on the basis of grade and staple length varied irregularly, and it was not unusual for some farmers to receive higher prices for some grades and staples than others did for higher grades and staples on the same day. Local market prices reflected about 33 percent of the central market premiums for grades above middling and about 17 percent of those for staple lengths over ⅞ in., and 60 percent of the discounts for grades below middling and less than 6 percent of those for staples shorter than ⅞ in. Premiums and discounts in local markets were considerably less than the variations in prices for the same grade and staple-length designations on the same day in the same market. Average premiums and discounts varied irregularly from month to month, and there was no consistent relation between them and type of market or number or type of buyers on the market. Lack of knowledge of correct classification and commercial value of cotton, differences in characteristics of cotton, inadequate volume of some grades and staple lengths, and differences in bargaining power of farmers and local buyers were the principal factors responsible for local prices failing to reflect central market premiums and discounts. Average prices were somewhat higher in the local markets where the cotton averaged higher in grade and staple length.

Local marketing practices can be improved by classification by disinterested, competent, reliable classifiers, the production in communities of a more uniform quality of cotton, and by supplying farmers with adequate information as to prices, premiums, discounts, etc., in the central markets.

Quality of product determines demand for New York hops, J. D. HARLAN (*Farm Res. [New York State Sta.], 2 (1936), No. 2, p. 10, fig. 1*).—Data are given as to the production and prices of hops in New York and other States and countries, and the hop-producing areas in New York.

Consumer preferences for cheese, A. HOBSON and M. A. SCHAARS (*Wisconsin Sta. Res. Bul. 128 (1935), pp. 48, figs. 11*).—Consumers' preferences for different varieties and ages of cheese were tested (1) by serving different kinds of cheese for a period of a week to approximately 650 students in the university dormitories, (2) by obtaining the preference of from 879 to 2,112 customers of retail stores in cities in different States for different cheeses sampled, (3) by obtaining the preferences of groups of rural people attending meetings in Wisconsin, and (4) by serving different types of cheese daily over a period of 15 weeks to approximately 110 short course students of the Wisconsin College of Agriculture, and to 25 supervising nurses and 40 doctors of the Wisconsin General Hospital. Consumers' buying and serving practices were obtained through interviews with 2,295 housewives in 6 cities of Wisconsin, Ohio, Pennsylvania, and Georgia. The effect of menu on cheese consumption was obtained by analyzing the data from the 15-week experiment

with the short course students, nurses, and doctors. Data regarding the consumption of cheese were obtained from 15 of the larger hotels in Wisconsin, and 253 purchases of cheese in retail stores of 7 cities were made and graded to ascertain the relation of cheese quality to retail prices.

The utilization of milk, cheese production and consumption of cheese in the United States and foreign countries, and the international trade in cheese are briefly discussed.

Switzerland has a per capita consumption of cheese 4 times as great as that of the United States, Denmark and Holland nearly 3 times, and Italy, Norway, Germany, France, and Sweden 2 times.

The preferences of 650 university students ranked according to per capita consumption were—men, mild American, processed American, low grade American, swiss, aged American, and brick; women, processed American, low grade American, mild American, aged American, brick, and swiss. The preferences of the customers of retail stores for the different pairings of cheese were—natural mild American 48 percent, natural aged American 52 percent; processed American 66 percent, natural mild American 34 percent; natural aged American 39 percent, processed American 61 percent; natural brick 33 percent, processed brick 66 percent; processed swiss 60 percent, and natural swiss 40 percent. The percentage of women preferring processed cheese was greater than that of the men, and the preferences of farm residents for processed cheese were greater than those of city dwellers. In the 15-week test the students ate more processed cheese than other types, the amount after the first 4 weeks equalling that of the mild and aged American combined. The nurses ate about equal amounts of mild American and processed cheese, with aged natural third and tending to decline till very little was eaten at the end of the period. The doctors and surgeons till the end of the sixth week preferred natural mild, after which the consumption of processed cheese led by a wide margin. More cheese was eaten with meals consisting of cold dishes or meat substitutes, meals rather scanty in variety or volume, and meals consisting of fruit salad or fruit dessert, especially pie. Of the hotel guests, 66 percent ate raw cheese, and 51 percent cooked cheese with table d'hôte meals; with à la carte meals the percentages were only 24 and 16 respectively. Prices did not reflect quality in most of the markets studied.

Crops and Markets, [January–February 1936] (*U. S. Dept. Agr., Crops and Markets, 13 (1936), Nos. 1, pp. 32, figs. 3; 2, pp. 33–80, figs. 3*).—Included are the usual tables, charts, reports, and summaries covering crop and livestock estimates, market reports, and the price movements of important agricultural products.

No. 2 contains the January 1, 1936, livestock inventory by the Department.

RURAL SOCIOLOGY

The population of a selected "cut-over" area in Louisiana, T. L. Smith and M. R. Fry (*Louisiana Sta. Bul. 268 (1936), pp. 46, figs. 10*).—This study, which was conducted cooperatively by the Federal Emergency Relief Administration, the State Emergency Relief Administration, and the station, was designed to assemble the pertinent facts relating to the quantity, quality, and present situation of the population in a selected land-retirement area in La Salle Parish, including 862 families, or 3,385 individuals, with an average population density of 32 persons per square mile. Of these, 2,138 individuals belonging to 559 families resided in sawmill villages and logging camps and were directly dependent upon the lumbering industry. In the open country there were only

1,247 individuals belonging to 273 families, or an average density of about 12 persons per square mile if land held by lumber companies is included.

In the open country the population was almost exclusively native white, compared with large numbers of negroes found in the sawmill villages. These people were almost exclusively Protestant, and their educational training had been very slight. Analysis of the marital status and the age and sex distributions showed a great dearth of young adults in both open country and villages. The population is only approximately replacing itself.

There has been relatively a small amount of migration in and out. The relief situation remains acute. Fully one-half of the farm families have been on the relief rolls. Shiftlessness is characteristic of a majority of the families. They prefer supervision to leading out for themselves. Buildings and home furnishings are in run-down condition, and the people have become so helpless that they have ceased to help themselves in the small ways available to them. Very little food is preserved.

Farms are small, the cultivated areas slight, and too much dependence is placed upon the very limited acreages of cotton. Livestock is scarce. The nature of the territory seems to call for extensive rather than intensive methods of cultivation. The investigators failed to discover wholesale evidences of biological deterioration, though there has been a sapping of initiative. Isolation seems to be one of their greatest handicaps.

Measurements of family relationships in farm families of central New York, H. W. BEERS ([*New York*] *Cornell Sta. Mem. 183 (1935), pp. 38, fig. 1).*—Case studies were made of 85 families, of which 41 were classed as most successful, 14 as least successful, and 30 as intermediate. The case material was obtained by interviews that were conducted with an unconcealed research approach, and the data provide a description of selected factors in the homes of normal farm families. Analysis is made of the environmental and intellectual factors on the bases of the farm business, extra-familial social participation, and intellectual status of adult members and of the properties of the family group on the bases of shared activities, demonstration of affection, interaction between parents, children, parent-child and child-child relations, and factors that change as the family matures.

A chart shows the relationship between each of 31 major categories where the tetrachoric correlations were more than ±0.30. Environmental factors of first importance were found to be economic status and social participation. As the family business increases, there is a dissociation of "family" and "business", and the part taken by wife and children in farm management and farm finances becomes less. Leadership of wife in extra-family groups is related to certain home qualities reflected in sharing of many activities, attraction to home of neighborhood children, impressions of integration, and home sex instruction of children. The intelligence of adult members is reflected to a minor extent in family attributes. The most significant properties of the family group related to other characteristics are sharing of activities, integration, demonstration of affection, and certain interparent, parent-child, and child-child relations. Farm family characteristics normally change with growth. Families, like individuals, mature.

Rural community organization in public welfare, H. L. MORGAN and R. M. SORY (*Missouri Sta. Bul. 358 (1935), p. 95).*—Data are included as to the number, sex, race, and marital status of inmates of 111 county almshouses in Missouri, the reasons for entrance, and the place of residence at the time of entrance.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

List of technical workers in the Department of Agriculture, and outline of Department functions, 1935 (*U. S. Dept. Agr., Misc. Pub. 233 (1936), pp. III+132*).—This is a revision of the list previously noted (E. S. R., 71, p. 415).

Availability of education to Negroes in rural communities, A. CALIVER (*U. S. Dept. Int., Off. Ed. Bul. 12 (1935), pp. IV+86, figs. 3*).—This bulletin is based on data covering 57,530 Negro children in 28 counties of 6 southern States maintaining separate schools for the colored race. Analysis is made of the accessibility and quality of educational facilities and the amount of such facilities available.

Farm mechanics text and handbook, G. C. COOK, L. L. SCRANTON, and H. F. MCCOLLY (*Danville, Ill.: Interstate Ptg. Co., 1935, pp. 450+[4], figs. [228]*).—This handbook contains sections on woodwork; painting, finishing, and glazing; rope work; belt work and power transmission; harness work; concrete work; sheet metal work; farm forge work; farm home conveniences and sanitation; farm motors; and farm machinery.

Business problems in farming, R. W. ROBERTS and F. W. LATHROP (*U. S. Dept. Int., Off. Ed., Vocat. Ed. Bul. 183 (1936), pp. VI+71*).—Included are suggestions for teachers of agricultural evening classes for the teaching units covering improving the farm, selecting a farm, buying a farm, buying insurance, making the farm inventory and credit statement, recording receipts and expenditures, summarizing the year's business, interpreting the agricultural outlook, selecting and adjusting the enterprises, financing current farm operations, and planning cooperative activities.

Elements of farm management, J. A. HOPKINS ([*Ames, Iowa*]: *Author, 1935, 2. mimeogr. ed., pp. [1]+XI+252, figs. [21]*).—This is a mimeographed textbook. The several parts deal with the choosing of an occupation and the type of farm, specialization vs. diversification, obtaining a farm, the basic principles in organizing the farm, the crop and livestock systems, the economizing of labor and power, the summarizing of the farm budget, the current operation of the farm, and external relationships, including cooperation, financing, and marketing.

FOODS—HUMAN NUTRITION

[Studies in foods and nutrition by the Iowa Station] (*Iowa Sta. Rpt. 1935, pp. 90, 162–169*).—Progress reports (E. S. R., 72, p. 866) are given on studies by V. E. Nelson, P. M. Nelson, and B. Lowe on the effect of heated fats on vitamin A in food materials; by P. M. Nelson, Lowe, and J. H. Buchanan on the relative shortening values of different lards and other fats, with an attempt to determine the relation of the shortening power to the physical and chemical constants of these fats, and on the chemical and physical changes in fat which take place in the deep fat frying of doughnuts; by P. M. Nelson and P. P. Swanson on the average response of rats to two experimental diets containing dried canned pork muscle as the sole source of protein at a 15-percent level with and without wheat germ oil as an additional source of vitamin E, on the standardization of the biological method for the assay of vitamin A in common food materials with statistical analysis of the reliability of the biological technic in the authors' laboratory, on the mean weights of the female rats of the stock colony at certain life periods and the ages of the female at critical periods of development, and other fertility data; and by Swanson and E. S. Haber on the Sherman unit vitamin A value of corn seedlings.

[Nutrition studies by the Missouri Station] (*Missouri Sta. Bul. 358 (1935), pp. 23, 24, 25*).—Progress reports are given on studies by A. G. Hogan and L. R. Richardson on irradiated vitamin B complex and dermatitis (E. S. R., 72, p. 564); and by Hogan and W. S. Ritchie on the nutritional requirements of rabbits and guinea pigs and on the nutritional properties of muscle meat, liver, and kidneys.

[Food preparation studies at the Wyoming Station] (*Wyoming Sta. Rpt. 1935, pp. 20–22*).—This progress report includes as a preliminary report on frying in deep fat at high altitudes formulas for doughnuts and the smoking points for different fats at the high altitude of the station. A continuation of the study of the culinary properties of potatoes (E. S. R., 72, p. 719) is also noted.

[Meat cooking investigations by the Missouri Station] (*Missouri Sta. Bul. 358 (1935), pp. 78, 79*).—This progress report (E. S. R., 72, p. 560) summarizes further studies by J. A. Cline and V. Dizmang on methods of cooking less tender cuts of U. S. medium grade beef and by Cline and A. Swenson of searing v. constant temperature methods of roasting beef, lamb, and pork.

Effect of oven temperatures on the tenderness of meat (*Texas Sta. Rpt. 1934, p. 124*).—This is a progress report of a comparison by S. Cover of the effect of high (225° C.) and low (125°) temperature on the tenderness of paired rib, rump, and round bone chuck roasts from 12 U. S. choice beef carcasses.

Progressive changes in the composition of edible shell eggs during storage, L. C. Mitchell (*Jour. Assoc. Off. Agr. Chem., 17 (1934), No. 3, pp. 506–511*).—A study carried out under the U. S. D. A. Food and Drug Administration indicates that the differences between fresh and storage eggs are due to changes produced by osmotic action through the vitelline membrane. "The differences are particularly noticeable when the composition of the yolks separated from 2-day-old eggs is compared with that of storage eggs. However, when the value of the various determinations on the whites, yolks, and whole eggs, respectively, [is] calculated on the basis of the dry substances for the 2-day-old, commercial fresh, and storage eggs and compared, few or no changes appear, that is, other than the transfer of water from the whites to the yolks and the loss of water by evaporation through the shell."

Data supporting these conclusions are tabulated.

Iodine content of Oklahoma vegetables, V. G. Heller, M. Jones, and L. Pursell (*Oklahoma Sta. Bul. 229 (1935), pp. 8, figs. 2*).—This is the complete report of a study noted essentially from a preliminary report (E. S. R., 74, p. 412). The vegetables analyzed included asparagus, beets, string beans, carrots, cabbage, Swiss chard, lettuce, radishes, potatoes, spinach, okra, mustard greens, turnip greens, beet greens, tomatoes, and sweetpotatoes. In addition to the conclusions noted in the preliminary report, it is stated that the iodine content of the vegetables analyzed appeared to depend more on the place of growth than on the variety. Vegetables produced in localities where salty waters are used in irrigation or occur normally often had twice the iodine content of the same variety grown elsewhere.

The method used was that of von Kolnitz and Remington.[1]

Fig products investigation, H. M. Reed (*Texas Sta. Rpt. 1934, pp. 159, 160*).—This progress report (E. S. R., 71, p. 873) includes a continuation of the frozen storage and drying experiments and miscellaneous studies concerned with the preparation of fig pastes and fig crush, the prevention of crystallization in canned figs, and the storage of fresh figs.

[1] H. von Kolnitz and R. E. Remington. Indus. and Engin. Chem., Analyt. Ed., 5 No. 1, pp. 38, 39.

Honey and some of its uses, E. F. WHITEMAN and F. W. YEATMAN (*U. S. Dept. Agr. Leaflet 113 (1936), pp. 8*).—This leaflet contains general information on the chief sources of honey in the United S ates, the forms in which it is marketed, its food value, and ways in which it can be used, both uncooked and as a substitute for sugar in cooked foods. A few special recipes are included, together with tables illustrating for white and chocolate cakes the necessary alterations in quantities of certain ingredients of food recipes when honey is substituted for sugar.

Nutrition and public health, E. BURNET and W. R. AYKROYD (*League Nations Health Organ. Quart. Bul., 4 (1935), No. 2, pp. 323–474, fig. 1*).—This report, which was prepared at the request of the Health Committee of the League of Nations, is addressed to public health authorities rather than to the specialized student of nutrition in the hope that "in some degree it may help the reader to visualize public health work in nutrition as an integral and highly important part of public health activity in general."

Various general aspects of the problem of the place of nutrition in public health are first discussed, including differences between individual and mass requirements; pathological, average, and optimal nutritional status; differences in dietary habits dependent on race, climate, and custom; and the evolution of dietary habits leading to the present newer knowledge of nutrition.

Dietary requirements for various age groups are next considered in terms of food constituents and actual foodstuffs and methods of assessing nutritional status, with the recommendation that "for practical public health purposes it is advisable that clinical, anthropometric, and physiological methods should be applied in association." The world resources of foods available to meet these dietary requirements are discussed with reference to U. S. D. A. Circular 296 (E. S. R., 70, p. 416) and with particular emphasis on four staple foods—bread, meat, milk, and fat. In attempting to answer the question of the best application of the available resources for meeting nutrition requirements, various types of educational agencies, for the most part in the United States, are described briefly, and specific examples of public health and nutrition work are given in considerable detail under the groupings of nutrition in childhood, food deficiency diseases, and collective feeding.

The final sections, entitled New Questions and The Problem of Nutrition on a National and International Scale, include many suggestions for further nutritional and dietary studies and for the organization of the work on a national and international scale. "If we might be allowed to suggest the lines that seem to us desirable, particularly at the present juncture, for dealing with the practical problem of nutrition, we would say that production, distribution, and consumption have hitherto been considered mainly as economic phenomena, without sufficient regard to their effect on public health, but that the fact of the economic depression has directed attention to the gap which almost everywhere exists between dietetic needs, as determined by physiology, and the means of satisfying them possible under existing economic conditions. The general problem of nutrition, as it presents itself today, is that of harmonizing economic and public health development."

The report contains seven appendixes dealing with special reports from various countries and a list of 129 references to the literature.

Nutrition and public health (*Brit. Med. Jour., No. 3896 (1935), pp. 459, 460*).—In this editorial discussion of the report noted above, attention is called particularly to the statement in the report that nutrition "is an economic, agricultural, industrial, and commercial problem, as well as a problem of physiology." Commenting upon this statement, it is noted that "many of these social, economic, agricultural, industrial, and commercial aspects of nu-

trition are outside the range of activity of the practitioner of medicine. They are the concern of those responsible for the wise spending of public funds in ways that will bring the greatest good to the greatest numbers. In some of these regards there is much opportunity for the exercise of a greater wisdom, a greater courage, and a more prudent use of both land and labor."

Nutrition considered in relation to public health and to economic conditions (*Genève* (*Geneva*): *League of Nations, Inform. Sect., 1935, pp. 24*).—This publication of the Information Section of the League of Nations sketches briefly the work of the Health Committee of the League during the decade of 1925–35 on the question of the best possible feeding of the greatest number, leading up to the report noted above, which is summarized briefly. This is followed by a discussion in chronological order of the developments under the 1935 program of the League in an effort to promote the policy (which has been named the marriage of health and agriculture) that "increased consumption will improve public health, will provide a market for agricultural produce, will create wealth." Summaries are given of the discussions on nutrition and the recommendations and resolutions presented at the 1935 International Labor Conference, the Assembly of the League of Nations in September 1935, and the meeting of the Health Organization of the League of Nations in October 1935. Future work on the problem as planned by the League is described briefly, with the committees appointed to carry out the work.

Report on the physiological bases of nutrition (*Genève* (*Geneva*): *League of Nations, Health Organ., 1935, pp. 19*).—In the introduction to this report by the Technical Commission appointed by the Health Committee of the League of Nations to define "the nutritional needs of the human being in the course of its development from conception to the adult age", the main stages of the work of the Health Organization of the League from 1925 to 1935 are summarized more specifically than in the publication noted above, with the steps leading up to the appointment of the Commission. The instructions to the Commission are quoted, its personnel is listed, and a brief account is given of its first meeting held in London, November 25–29, 1935, under the chairmanship of E. Mellanby.

Part 1 of the report deals with the requirements of energy-giving foods and part 2 with mineral and vitamin requirements. An allowance of 2,400 calories net per day is given as the basic energy requirement for an adult, male or female, "living an ordinary everyday life in a temperate climate and not engaged in manual work." The supplements to be added to the basic requirement for muscular activity are for light work, up to 50 calories per hour of work; moderate work, 50–100 calories; hard work, 100–200 calories; and very hard work, 200 calories and above per hour of work. The coefficients for calculating energy requirements for other ages start with 0.3 (giving an allowance of 720 calories) for 1–2 yr. and increase by 0.1 each year up to 12 yr. For this age and beyond, the requirement for both males and females is the basic 2,400 calories, except for nursing mothers, in which case a coefficient of 1.25 should be used. For babies under a year, the values are given in calories per kilogram of body weight—100 from birth to 3 mo., 90 from 3 to 6 mo., and 80–90 for from 6 to 12 mo. The activities of children of both sexes from 7 to 11 and girls from 11 to 15 yr. are considered to be equivalent to light work, and of boys from 11 to 15 yr. as moderate work. For women engaged in household work the activity is reckoned as that of light work for 8 hr. daily.

Average allowances for total protein are 3.5 g per kilogram of body weight for the age group of 1–3 yr., 3 for 3–5, 2.5 for 5–15, 2 for 15–17, 1.5 for

17–21, and 1 g per kilogram of body weight for 21 yr. and upwards. An allowance of 2 g per kilogram of body weight is recommended for both pregnant and nursing women.

Mineral and vitamin requirements are discussed in general terms with reference to protective foods and quantitatively in terms of the requirements for the pregnant and nursing woman, as the one who "should be regarded as the member of the population needing the greatest 'protection' in order to insure adequate physical endowment for the child at birth and optimum nutrition during infancy."

Four tables are given of specimen diets considered satisfactory for pregnant or nursing women, infants, children 2-3 yr. of age, and children 3-5 yr. of age in terms of protective foods and supplementary energy-yielding foods, with as far as possible the quantitative values of the separate food items.

The committee recommends the following problems for further study: Assessment of the nutritional state of children, nutritive food requirements during the first year of life, minimum vitamin and mineral requirements, minimum fat requirements, the nutritive and "supplementary" values of the different protein-containing foods to determine to what extent and in what forms animal protein is necessary for growth and health, the relative nutritive value of different cereals according to the degree of milling, the extent to which the increasing consumption of sugar is detrimental to health, influence of climate on food requirements, and the extent to which diets in common use fall below the standards recommended in this report.

Report of expert committee on nutrition (*Brit. Med. Jour., No. 3911 (1935), pp. 1215, 1216*).—The history of the activities of the Health Organization of the League of Nations in the study of nutrition in relation to health is traced briefly, and a summary is given of the report noted above.

Science in modern life, F. G. HOPKINS (*Nature [London], 136 (1935), No. 3449, pp. 893–895*).—This is an abridgment of an address delivered on November 20, 1935, to the Royal Society [Great Britain].

In discussing the social responsibility of science, attention is called to the gap, now considered to be lessening, between the mind and outlook of the publicist and those of the trained scientist. The study of the nutritional needs of the body is cited as a branch of scientific inquiry which, with organized scientific effort and pooling of knowledge, can be used to bridge this gap. Present interest in the problems of nutrition with relation to a national food policy is discussed at considerable length, with particular reference to the activities of the Health Organization of the League of Nations, as noted above, to the annual reports of medical officers of health, and to various other publications. In discussing the question as to whether or not the time is yet ripe for the initiation of a comprehensive national food policy, it is emphasized that "if we take a long range view, any policy concerned with food production must ultimately, if it is to be ideal, become part of a world policy."

Rate of growth and length of life, H. C. SHERMAN and H. L. CAMPBELL (*Natl. Acad. Sci. Proc., 21 (1935), No. 5, pp. 235–239*).—In continuation of the statistical examination of the data obtained in the long-continued comparison of diets A and B (E. S. R., 71, p. 723), the growth data have been subjected to statistical analysis with reference to the length of life of the slower growing and faster growing animals of each sex in each group.

"An expression of the final outcome of all our comparisons of the longer-lived with the shorter-lived individuals of the same sex on the same diet indicates that the difference, if any, in rate of growth between the longer lived and the shorter lived was only about one-fifth its probable error, which, in view of previous statistical study of such growth data, may be interpreted as

showing clearly that rate of growth and length of life here vary independently of each other. Or, differently stated, among individuals of the same sex and the same heredity, on the same normal diet, those who grew faster and those who grew more slowly had equally good prospects of a long life."

Relation of food to regularity of nutritional response, H. C. SHERMAN and H. L. CAMPBELL (*Natl. Acad. Sci. Proc., 21 (1935), No. 7, pp 434–436*).—In continuation of the statistical comparisons noted above, coefficients of variability have been determined for various criteria of nutritional response in strictly parallel groups of animals on the two diets.

With the exception of the ages of females at birth of their first young, which gave slightly higher coefficients of variability for diet B than diet A, the main differences of response all showed lower coefficients of variability for the animals on diet B than on diet A. These included weight at 28 days, gains in weight during the fifth and eighth weeks of life, inclusive, duration of capacity for reproduction, number of young born, number and percentage of young reared, weight of young, and length of life. "Thus the main differences of response of the experimental animals to diet B as compared with diet A—more rapid growth, a capacity for more successful reproduction, and an extension of the adult life cycle—show not only higher average attainment but greater regularity as well. Hence it would seem that in such cases as this the higher level of response is a true indication of superior nutritional well-being, and that the enrichment of the already adequate diet was here quite certainly a real improvement."

The haemoglobin level among London mothers of the hospital class, H. M. M. MACKAY (*Lancet [London], 1935, I, No. 25, pp. 1431–1434*).—Data are given on the hemoglobin level, as determined with a Haldane hemoglobinometer using as standard a Price-Jones-Haldane tube, among 368 London women as follows:

A group of 50 nursing mothers whose babies had been brought to the Mothers' Hospital infant welfare center had minimum, maximum, and average hemoglobin values of 66, 103, and 82 8 percent. Corresponding values for a second group of 109 pregnant women and girls in homes for unmarried mothers were 58, 120, and 83.5 percent. A third group of 209 mothers who had brought their children to the out-patient department of Queen's Hospital for Children had values of 48, 106, and 87.2 percent, respectively.

The average of all three groups, 85 5 percent as compared with the Price-Jones average figure for healthy women of 98.26 percent, indicates a considerable degree of anemia. Calling 90 percent the lower limit of normality, only 14 percent of the first group, 26 percent of the second, and 40 percent of the third group could be considered to have normal hemoglobin values. Attention is called to a similar degree of anemia observed in previous studies of infants in the same social group and to reports in the literature indicating that anemia is very common among women. Various questions are raised as to the relation of iron deficiency to the anemias of mothers and children, and the conclusion is drawn that "the treatment of pregnant women with iron in adequate doses and for a sufficient period would probably do much to lessen the incidence of anemia among their babies—though we would urge that direct treatment of the baby should certainly not be neglected. It must be remembered that treatment of a nursing mother with iron does not apparently increase the iron available in her milk.

"In human nutrition we are apt to take short views. Work with laboratory animals indicates the need of much longer views. In anemia we see the effects of breaking a dietetic commandment visited on the second generation. Fortunately the remedy is simple."

[Vitamin studies by the Washington Station] (*Washington Sta. Bul. 325 (1935), pp. 42, 43*).—This progress report (E. S. R., 73, p. 133) includes summaries of studies by E. N. Todhunter on the vitamin C content of Cuthbert raspberries when frozen and after thawing for 24 hr. at room temperature, the vitamin A content of the peel and flesh of the Richared apple, a comparison of the vitamin C content of the Richared and Delicious apples, and the changes in the vitamin C content of the Delicious apple after storage for 6 mo. at 32° F. and 6 and 12 mo. at 45°.

The vitamin A, B, C, D, and G content of the outer green leaves and the inner bleached leaves of Iceberg lettuce, H. E. MUNSELL and M. H. KENNEDY (*Jour. Agr. Res. [U. S.], 51 (1935), No. 11, pp. 1041–1046*).—This contribution from the U. S. D. A. Bureau of Home Economics summarizes studies covering a period of 10 yr. on the distribution of vitamins A, B, C, D, and G in the outer green leaves and inner bleached leaves of Iceberg lettuce, grown for the most part in California and purchased on the Washington market. The outer green leaves were those generally trimmed from the head before it is sold and the inner bleached leaves those showing no greenness.

The green leaves contained about 34.5 vitamin A units (Sherman) per gram, while the bleached leaves contained only 1 unit per gram. This is in harmony with earlier reports of Kramer et al. (E. S. R., 62, p. 397), indicating that the green leaves are 30 or more times as rich as the bleached leaves in vitamin A.

The tests for vitamin B (B_1) and vitamin G (B_2) were conducted on rats from two colonies. The Chase and Sherman technic was followed in the B tests and that of Bourquin and Sherman, modified by using an alcoholic extract of rice polishings instead of a similar extract of wheat, was used for the G tests. The B values obtained for the two colonies were 0.24 and 0.27 unit per gram for the green and 0.3 and 0.39 unit for the bleached leaves. The ratio of potency of green leaves to bleached was thus 0.8 for the animals of the first colony and 0.69 for the second. In view of the variability of results obtained by the biological method, the differences between the green and bleached leaves as sources of vitamin B are considered insignificant.

The absolute values for vitamin G obtained with the two colonies were quite different, 0.46 and 1.18 units per gram for the green and 0.24 and 0.67 unit for the bleached, but the ratios of potency of green: bleached were similar, 1.91 and 1.76. In earlier studies by Kohman et al. (E. S. R., 67, p. 88) before the differentiation of the vitamin B complex, the outer green leaves of lettuce had been shown to be appreciably richer in the vitamin B complex than the inner bleached leaves.

Two different series of tests for vitamin C showed that 21 g daily was about the minimum protective dose for guinea pigs, with slightly better results for the green than the bleached. This is in good agreement with the earlier conclusion of Kohman et al. of a minimum protective dose of between 15 and 25 g, with very little difference between the green and the bleached leaves.

In the vitamin D tests neither the green nor the white leaves showed any curative effect (line test technic) for rats in which rickets had been produced on the Steenbock yellow corn-low phosphorus diet.

The vitamin A and C content of Chili pepper, M. B. RUTHERFORD (*Spice Mill, 58 (1935), No. 11, p. 775*).—The variety of Chili pepper used in this study at the U. S. D. A. Bureau of Home Economics was *C. ancho*. Cured peppers were received directly from California and prepared for the tests by stemming, seeding, and drying sufficiently for grinding. The ground material was allowed to stand until it reached an air-dry condition before being used.

The powdered dried material was found to have an exceptionally high content of vitamin A, 893 Sherman units per gram. This figure is from 2 to 3 times as high as reported for a good grade of dairy butter.

In the vitamin C tests the material had to be incorporated in the basal diet, as the guinea pigs would not eat it in any other way. With a pepper consumption as high as 5 g a day no protection was secured, indicating that the dried pepper contains insignificant amounts of vitamin C.

Vitamin A deficiency in spite of adequate diet in congenital atresia of bile ducts and jaundice, M. D. ALTSCHULE (*Arch. Path., 20 (1935), No. 6, pp. 845–856*).—Microscopic changes characteristic of vitamin A deficiency, as defined by Wolbach and Howe (E. S. R., 70, p. 875), were observed on autopsy in 6 of 11 infants who had died from severe protracted jaundice due to congenital atresia of the bile ducts, in spite of the fact that the infants had been receiving diets adequate in vitamin A and had not shown clinical evidence of xerosis or xerophthalmia during life. All but 1 of the infants showing vitamin A deficiency were 6 mo. of age or older at the time of death, while of the 5 showing no microscopic evidence of vitamin A deficiency all but 1 were not more than 9 weeks of age. The deficiency is thought to have occurred as a result of failure of absorption of vitamin A from the gastro-intestinal tract due to absence of bile.

Parenteral administration of vitamin A is recommended for patients with severe obstructive jaundice. It is also suggested that the oral administration of the vitamin together with bile salts may possibly be of value.

Rôle of bile in vitamin A utilization (*Jour. Amer. Med. Assoc., 106 (1936), No. 9, p. 709*).—This editorial discussion is based chiefly on the paper noted above.

The water-soluble B-vitamins.—IV, The components of vitamin B_2, H. CHICK, A. M. COPPING, and C. E. EDGAR (*Biochem. Jour., 29 (1935), No. 8, pp. 722–734*).—In this continuation of the series of papers noted previously (E. S. R., 65, p. 592), further evidence is given in proof of the theory advanced by several investigators whose work is reviewed briefly that vitamin B_2, defined as "the heat-stable constituent of the vitamin B complex which must be added to diets containing all other dietary essentials, including the antineuritic vitamin B_1, in order to maintain growth and health in the rat and prevent occurrence of dermatitis ('rat pellagra')", is composed of two factors, one of which is a flavine. The other factor is thought to be identical with the factor Y of Chick and Copping, as described in the previous paper of the series, and also with vitamin B_6, as described and named by György (E. S. R., 72, p. 282). The evidence on which this conclusion is based is essentially as follows:

Pure hepatoflavine or lactoflavine, when added as a small daily dose to the basal vitamin B_2-free diet of Chick and Roscoe (E. S. R., 60, p. 690), restored growth in rats to a small extent. Normal growth was attained on the further addition of a small daily dose of an autoclaved yeast extract which had been subjected to two successive treatments with fuller's earth or a yeast extract autoclaved at 120° C. for 5 hr. at pH 9. The flavines had no curative effect upon florid dermatitis and, with one or two exceptions, no effect upon the more generalized nonspecific type of skin disorder sometimes developing on the vitamin B_2-free diet.

The heat-stable supplementary material had no effect in restoring growth or checking the nonspecific skin disorder, but had a slight though irregular curative effect for the florid type of dermatitis. When both supplements were given together, there was a speedy cure of either or both types of skin disorder and prompt restoration of growth.

The authors suggest that "the term vitamin B_2 be retained for the association of (1) flavine and (2) supplementary substance, that (1) be known simply as flavine, since it has been identified with a substance of known chemical constitution, and that (2) be called vitamin B_6 until such time as its chemical nature and identity are established." Vitamin B_6 is the most heat- and alkali-stable constituent of the B vitamins, for it can resist prolonged autoclaving in alkaline solution at pH 9. "The activity is found present in the dialyzate after dialysis through a cellophane membrane and is not removed by precipitation with lead acetate either at pH 4 or 8, in this property affording a contrast with flavine."

Attention is called to the accidental discovery that the vitamin B_2 complex is sensitive to visible light, and evidence is summarized indicating that it is the flavine constituent rather than vitamin B_6 that is destroyed by visible light.

Effect of storage upon the vitamin C content of Wyoming potatoes, E. J. THIESSEN (*Wyoming Sta. Bul. 213 (1936), pp. 24, figs. 10*).—This is the complete report of an investigation noted from progress reports (E. S. R., 72, p. 719).

Potatoes of the Bliss Triumph variety, grown upon both irrigated and dry land in different parts of Wyoming during four successive years, were used in all of the tests. The fall feeding tests were started in September soon after the potatoes were harvested. During the winter months the tubers were stored in the storage cellar at the agronomy farm, which was maintained at temperatures of from 38° to 42° F. The feeding tests on old potatoes were begun after 6 months' storage. The potatoes were fed peeled, both raw and after cooking for about 15 min. The vitamin C content was judged both by growth and by the symptoms of scurvy in the experimental guinea pigs.

The vitamin C content of the potatoes was fairly constant for the crops of the four successive years, about 0.2 Sherman unit per gram. The samples grown on dry land rated slightly higher in vitamin C content than those grown on irrigated land in the tests made directly after harvesting and during the early months of storage. The potatoes which had been stored for 6 mo. contained about 0.1 unit of vitamin C per gram, indicating that approximately one-half of the vitamin C content had been lost during the storage period. The loss was about the same for the dry land as for the irrigated samples, but in diseased and scabby potatoes the loss was greater than in the potatoes in a better physical condition.

In the tests made directly after harvesting, little difference could be detected in the vitamin C potency of cooked as compared with raw samples, but after the winter storage the cooked samples quite consistently gave higher growth rate and better protection than the raw. It is noted, however, that the cooked potatoes had been boiled for only a short period of time and that greater destruction of vitamin C would probably have taken place during the longer period required if the potatoes had been left whole or cut in larger pieces.

Other tests reported showed that old potatoes which had sprouted, but were fed without peelings or sprouts, gave no better protection than unsprouted, that solanine may have been responsible for the deaths of several of the guinea pigs during the 1931 test period when the potatoes had an unusually high content of solanine, and that new green cabbage used as the vitamin C supplement for the controls in the spring had a considerably higher content of vitamin C than the older stored cabbage fed in the early winter.

The treatment of diabetes mellitus, E. P. JOSLIN (*Philadelphia: Lea & Febiger, 1935, 5. ed., rev., pp. 620, figs. 9*).—In the revision of this well-known handbook, the author has had the cooperation of his associates H. F. Root,

P. White, and A. Marble and the assistance in certain chapters of H. Hunt, S. Warren, and W. R. Jordan. As noted in the preface, the volume records the author's experience with diabetic patients since 1898, from the so-called Naunyn era of treatment to the later Banting era, during which the average length of life after the onset of diabetes has been extended from 5 to 11 yr. and the average age of death from 44 to 63 yr.

Of particular interest in this section are the chapters on the etiology and prevention of diabetes, especially the section on obesity and diabetes; the physiology of diabetes, contributed by A. Marble, H. Hunt, and E. P. Joslin; the diet in health and in diabetes; the treatment of diabetes, especially the section on diet in the treatment of diabetes; the digestive system in diabetes, revised by A. Marble; diabetes in childhood, contributed by P. White; non-glycosuria, contributed by A. Marble; and foods and their composition. This final chapter includes the previously noted tables on food values prepared by E. M. Bailey (E. S. R., 74, p. 274). Various height and weight tables are given in an appendix.

TEXTILES AND CLOTHING

[Studies in textile chemistry by the Iowa Station] (*Iowa Sta. Rpt. 1935, pp. 171, 172*).—Progress reports (E. S. R., 72, p. 893) are given of studies by R. Edgar on deterioration of weighted silks by oxidizing solutions and by salt solutions and on the resistance of chlorinated wool fabric to acid and to alkaline solutions.

[Wool research at the Wyoming Station] (*Wyoming Sta. Rpt. 1935, p. 24*).—Studies of duplicate samples and large and small samples for shrinkage determination are reported briefly.

The alkaline mercerization of wool, M. Barr and R. Edgar (*Iowa State Col. Jour. Sci., 10 (1935), No. 1, pp. 45–48, fig. 1*).—Mercerization of plain-woven unstoved wool of 0.3 percent ash and no sulfates by 16, 29, 38, and 44 percent sodium hydroxide for 5 min. at 15° C. was followed by determinations of weight, nitrogen, sulfur, dry and wet warp breaking strength, and elongation at breaking load.

The loss in weight, nitrogen, and sulfur decreased with an increase in concentration from 16 to 38 percent sodium hydroxide and was greater at 44 percent. At 38 percent sodium hydroxide the wool lost 1.2 percent in weight, 1.0 in nitrogen, and 5.3 percent in sulfur. The loss of wet and dry breaking strength was less as the concentration of alkali increased. At 44 percent sodium hydroxide the dry breaking strength was 95 percent and the wet breaking strength only 40 percent of the corresponding values for the original wool.

The effect of salt on silk, E. C. Walde, J. E. Ross, M. Barr, and R. Edgar (*Jour. Home Econ., 28 (1936), No. 3, pp. 179–182*).—Plain-woven crepe of silk fibroin was found at the Iowa Experiment Station to develop no discoloration and to undergo no appreciable change in ash, weight, or nitrogen either when stored dry for 1 yr. after 10 hr. in 0.5 N sodium chloride at 40° C. or when heated at 100° for 1 hr. in 0.06 or 0.70 N sodium chloride. Silk and plain-woven crepes of black iron-weighted and white lead-weighted, tin-weighted, tin-lead-weighted, and zinc-weighted silks suffered no greater deterioration in wet warp breaking strength and elongation at breaking load than the controls and developed no discoloration. The practical significance of the results is pointed out.

Home dyeing with natural dyes, M. S. Furry and B. M. Vermont (*U. S. Dept. Agr., Misc. Pub. 230 (1935), pp. [1]+36, fig. 1*).—This publication has been prepared primarily for the handicraft industries which have been

source of family income in some rural communities and are also being developed in connection with various Federal and State relief activities.

Following a discussion of tests for color fastness and the principles involved in the harmonious combinations of different colors, simple equipment and supplies needed for dyeing craft materials at home are listed, and the steps in the dyeing process are outlined in some detail, with directions for mordanting wool and cotton and for using the dye recipes which have been developed. These recipes are arranged alphabetically by the name of the flower, bark, or other dye material used as the coloring matter. About 65 natural dye materials are included, all of which have been tested in the laboratory and found to produce attractive colors fast to both light and washing.

HOME MANAGEMENT AND EQUIPMENT

Studies of family living in the United States and other countries: An analysis of material and method, F. M. WILLIAMS and C. C. ZIMMERMAN (*U. S. Dept. Agr., Misc. Pub. 223 (1935), pp. 617*).—This compilation of information on studies of family living throughout the world has been prepared by the Bureau of Home Economics in cooperation with the Social Science Research Council and the Institute of Pacific Relations. The extensive annotated bibliography is preceded by a preface, by M. Handman, explaining the origin of the study; an introduction, by Williams, describing the scope of the report and defining the terminology adopted; a brief history of studies of family living contributed by Williams for the United States and Canada and by Zimmerman for other countries; and a discussion of methods used in studies of family living, including the methodology of the Le Play School, by Zimmerman, and of the statistical schools, by Williams.

The annotated bibliography, which includes approximately 1,500 studies of family living made in 52 countries, is arranged according to continent or main geographic regions and alphabetically by countries within the region. For most of the countries represented by more than 50 studies, the material is further classified by type or occupation of the families. Within the groups the studies are arranged by the chronological period to which the consumption data apply.

The bibliography is followed by keys which indicate by code numbers the type of material and methods followed in the various studies. These keys bring together in compact form many specific facts about the nature of the material in each study, the methods used in obtaining and summarizing the data, and supplemental data not included in the annotations. An author index is appended.

Farm family living: Outlook charts and conference summaries (*U. S. Dept. Agr., Bur. Home Econ., 1935, pp. [48], figs. 19*).—This mimeographed material is primarily intended for use with the Agricultural Outlook for 1936 (E. S. R., 74, p. 554).

[Studies in household equipment by the Iowa Station] (*Iowa Sta. Rpt. 1935, pp. 169–171, fig. 1*).—This progress report (E. S. R., 72, p. 894) contains a summary of a continuation by L. J. Peet and L. E. Sater of studies on the application of heat to cooking utensils of different materials, including determinations of the distribution of heat from various types of units over the surface of a pan and of the effect of different units on the efficiency and speed of long-time cooking processes carried out in aluminum utensils of light and black bottoms. The results are also summarized of a continuation of the study by Peet of the care of meat in the household refrigerator.

The optimum temperature for electric water heaters, E. H. ROBERTS (*Washington Sta. Bul. 325 (1935), p. 43*).—This progress report summarizes data obtained from manufacturers in the Pacific Northwest on temperature control.

MISCELLANEOUS

List of bulletins of the agricultural experiment stations for the calendar years 1933 and 1934, C. E. PENNINGTON (*U. S. Dept. Agr., Misc. Pub. 232 (1936), pp. 81*).—This list, arranged by States and containing author and subject indexes, supplements that previously noted (E. S. R., 71, p. 287).

Fifty-eighth Report of the Connecticut Agricultural Experiment Station, New Haven, for the year 1934, W. L. SLATE ET AL. (*Connecticut [New Haven] Sta. Rpt. 1934, pp. [733], pls. 8, figs. 164*).—In addition to the usual administrative data, this report contains reprints of Bulletins 365–376, previously noted, and of Circular 106, Dutch Elm Disease in Connecticut.

Forty-sixth Annual Report of the Storrs Agricultural Experiment Station, Storrs, Connecticut, for the year ending June 30, 1934, W. L. SLATE ET AL. (*[Connecticut] Storrs Sta. Rpt. 1934, pp. [346], figs. 66*).—This consists of reprints of Bulletins 199–206, previously noted.

Report on agricultural research [of the Iowa Station] for the year ending June 30, 1935, R. E. BUCHANAN ET AL. (*Iowa Sta. Rpt. 1935, pp. 220, figs. 25*).—The experimental work not previously abstracted is for the most part noted elsewhere in this issue.

Work of the [Missouri] Agricultural Experiment Station, [1934], F. B. MUMFORD, S. B. SHIRKY, ET AL. (*Missouri Sta. Bul. 358 (1935), pp. 123, figs. 5*).—The experimental work not previously abstracted is for the most part noted elsewhere in this issue.

Forty-sixth Annual Report [of New Mexico Station, 1935], F. GARCIA (*New Mexico Sta. Rpt. 1935, pp. 62, figs. 7*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-eighth Annual Report of the South Carolina Experiment Station, [1935], R. A. MCGINTY ET AL. (*South Carolina Sta. Rpt. 1935, pp. 162, figs. 32*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-seventh Annual Report [of Texas Station], 1934, A. B. CONNER ET AL. (*Texas Sta. Rpt. 1934, pp. 288*).—The experimental work not previously reported is for the most part noted elsewhere in this issue.

Forty-fifth Annual Report [of Washington Station], 1935, E. C. JOHNSON ET AL. (*Washington Sta. Bul. 325 (1935), pp. 83, fig. 1*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-fifth Annual Report of [Wyoming Station, 1935], J. A. HILL (*Wyoming Sta. Rpt. 1935, pp. 44*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Farm Research, January 1, 1936 (*Farm Res. [New York State Sta.], 2 (1936), No. 2, pp. 12, figs. 8*).—In addition to articles dealt with elsewhere in this issue and miscellaneous notes, the following are included: Seed Testing and Control Fields Show Up Poor Seed Stocks, by M. T. Munn (p. 2); Australia Developing a Butter Industry, by E. G. Pont (p. 3); Fertilizer and Feed Inspection Protects Farmer's Pocketbook, by A. W. Clark (pp. 5, 7); Soil Inoculant Inspection Form of Crop Insurance, by H. J. Conn (p. 6); National Dairy Show in St. Louis, by A. C. Dahlberg (pp. 6, 10); and Spray Materials Need More Careful Supervision, by G. W. Pearce (p. 11).

NOTES

Arkansas Station.—Dr. Etlar L. Nielsen has been appointed assistant agronomist, chiefly for breeding work in an attempt to develop satisfactory meadow and pasture grasses and legumes for the State, which at present lacks a satisfactory perennial meadow grass.

Colorado Station.—Two new departments have been inaugurated. One of these, effective April 1, is in range and pasture management, with Enoch W. Nelson of the University of Montana as head and M. S. Morris, formerly assistant in botany, as associate. The other, effective July 1, is a department of poultry husbandry in charge of Dr. H. S. Wilgus, Jr., investigator in poultry nutrition in the [New York] Cornell Station. Robert E. Trimble, assistant in irrigation investigations and meteorologist since 1888, retired July 1.

Hawaii Sugar Planters' Station.—Hamilton P. Agee, director for 22 years, has resigned to become consulting agriculturist for two commercial concerns. He has been succeeded by Dr. Harold L. Lyon, in charge of the department of botany and forestry. Dr. Alvin R. Lamb has been appointed research associate in chemistry.

Iowa College and Station.—Dr. Charles H. Stange, associated with the veterinary work of the institution since 1907, dean of the veterinary division since 1909, and director of veterinary research since 1913, died April 26 at the age of 56 years. Dr. Stange was a native of Iowa, graduating from the college in 1907, with further work in pathology at the University of Chicago. He had taken special interest in the advancement of professional veterinary medicine, and his work in connection with the land-grant college survey of 1928 has had distinct influence in raising veterinary educational standards. In 1924 he served as president of the American Veterinary Medical Association.

Kentucky Station.—The appointments are noted of Dr. Paul O. Ritcher as assistant entomologist, effective April 1, and James B. Smathers as field agent in cream grading, effective March 16, the latter succeeding J. C. Downing, resigned.

Maryland University.—Earnest A. Walker, assistant professor of botany and plant pathology in the South Dakota College, has been appointed assistant plant pathologist in the extension service.

Massachusetts College and Station.—Fred Coleman Sears, professor of pomology since 1907, retired at the end of the college year because of reaching the age limit.

Missouri University and Station.—Dr. H. M. Haag of the U. S. Farm Credit Administration has been appointed assistant professor of agricultural economics.

According to a recent issue of *Problemy Zhivotnovodstva* (*Problems of Animal Husbandry*), experiments in artificial insemination of mares at the station have supplied the foundation for a widespread use of this multiple method in the livestock improvement work of the Union of Soviet Socialist Republics. It is stated in this article that the technic developed at the station was used in the breeding of more than 4,000,000 farm animals in Russia in 1934 and 1935.

New Hampshire University.—Dr. Edward Morgan Lewis, president since 1927, died May 23. President Lewis was born in Wales on December 25, 1872, coming to this country at the age of 9 years, and receiving his education at Williams College. He had served as instructor in elocution in Columbia Uni-

versity in 1901–3 and the Yale Divinity School in 1904–14 and as assistant professor of oratory in Williams College in 1903–11. His work with the land-grant colleges began with his appointment in the Massachusetts College in 1911 as assistant dean and professor of literature. Subsequently he became head of the department of languages and literature and the division of the humanities, dean, acting president, and from 1926 to 1927 president. His administrative ability and cultural attainments were recognized by honorary doctorates conferred by the Massachusetts College and Amherst College in 1927 and Marietta College and the Rhode Island College in 1928. In the Association of Land-Grant Colleges and Universities, he was serving as a member of the committee on military organization and policy.

Washington Station.—A first prize was awarded a group of bulletins from the station entered in the American Exposition of Agricultural Publications held recently in Santiago, Chile.

Dr. G. W. Fischer, instructor in plant pathology and assistant plant pathologist, resigned May 1 to accept a position as agent in the Division of Forage Crops and Diseases, U. S. D. A. Bureau of Plant Industry.

Cooperative Wildlife Research.—The U. S. D. A. Bureau of Biological Survey announces cooperative agreements with land-grant colleges and universities in nine States for research and demonstration in wildlife management. The institutions are, respectively, concerned with the following major studies: Alabama, the mourning dove; Connecticut, the eastern cottontail rabbit; Iowa, the muskrat, middle western cottontail rabbit, and coot; Maine, the woodcock and grouse; Ohio, the raccoon, gray squirrel, and fox squirrel; Oregon, the antelope and possibly the blue grouse; Texas, the western bobwhite quail and western turkey; Utah, the mule deer and sage grouse; and Virginia, the wild turkey. One or more trial demonstration areas are being set up by each institution in order to work out a complete life history and management practice.

Animal Nutrition Division of U. S. D. A. Bureau of Animal Industry.—A new research unit was established May 1, with Dr. Paul E. Howe, senior biochemist in charge of nutrition investigations in the Animal Husbandry Division, as chief. The reorganization has been effected in order to give increased emphasis to research dealing with fundamental problems of the feeding and nutrition of farm animals. The work is to be grouped into four main units: Biological studies of nutritional problems with laboratory animals; the biochemistry and physiology of digestion; the nutritive requirements of cattle, sheep, swine, goats, horses, and dogs and general studies of the digestibility of feeds; and the nutrition of poultry.

Dominion Range Experiment Station.—This station was established in 1935 at Kamloops, British Columbia. At present over 500 head of cattle are being handled on a rugged range approximately 126,000 acres in extent with a limited amount of spring and fall range. Ultimately, it is expected to carry from 1,200 to 1,500 cattle and to deal with all problems with which the stockmen of the Province have to contend.

New Journals.—*Rural Sociology* is being published quarterly at Baton Rouge, La., by the rural sociology section of the American Sociological Society. In addition to announcements, abstracts of recent experiment station and other publications, book reviews, and news notes, the initial number contains the following original articles: National Policy and Rural Public Welfare, by E. L. Morgan (pp. 8–19); Size of Family in Relation to Homogeneity of Parental Traits, by W. C. McKain, Jr., and N. L. Whetten (pp. 20–27); Localization of Dependency in Rural Areas, by J. O. Babcock (pp. 28–39); Population Mobility, C. E. Lively (pp. 40–53); Littleville: A Parasitic Com-

munity During the Depression, by C. C. Zimmerman, J. H. Useem, and L. H. Ziegler (pp. 54–72); National Policies and Rural Social Organization, by L. Nelson (pp. 73–89); and County Organization for Program Planning in Virginia, by B. L. Hummel (pp. 90–93).

International Brewing Abstracts is being published monthly by Wahl-Henius Institute, 2374 Lincoln Avenue, Chicago. In addition to monthly reviews and reprints in full of articles concerning the science and practice of brewing, abstracts printed on index cards of standard size and drawn from 75 periodicals are to be supplied to subscribers monthly.

Hopeh Agriculture Science is being published by the Hopeh Provincial College of Agriculture, Paotingfu, Hopeh, China. The initial number contains several articles in Chinese and the following with more or less material in English: New Findings of Sterility in Soybeans, M. S. D. Swen (pp. 1–27); Suggestion of a New Formula for the Deviation of the Mean Method, Y. K. Yang (pp. 29–48); A Study of the Application of Some Methods for Calculating Experimental Errors, Y. K. Yang and C. Y. Tsuei (pp. 49–72); and Summary of Analysis of *Capsicum longum*, C. L. Yu and Yung-fu (pp. 103–114).

The New Guinea Agricultural Gazette is being published at Rabaul by the Department of Agriculture of the Territory. Papers dealing with original research will be included, the initial number containing Peanuts as a Crop for New Guinea, by G. H. Murray (pp. 3–15); The Long-Horned Tree-Hopper of Coco-Nuts (*Sexava* spp.), by J. L. Froggatt (pp. 16–27); Derris: Its Cultural and Economic Possibilities for the Territory of New Guinea, by R. E. P. Dwyer (pp. 28–41); The Preparation of New Guinea Cacao for Market, by E. C. D. Green (pp. 42–46); and *Eucalyptus naudiniana*, by C. C. Marr (pp. 47–49).

Connecticut Woodlands is being published in the winter, spring, and fall by the Connecticut Forest and Park Association at New Haven. The initial number contains among other material the following articles: The Improved Wood-Burning Stove, by R. C. Bryant (pp. 3–6); The 4-H Forestry Clubs, by W. E. Brockett (p. 6); The Wildlife Research Station at Storrs, by A. E. Moss (pp. 7, 8); State Conservation Agencies, by H. H. Chapman (pp. 9–11); and The Dutch Elm Disease Situation, by W. O. Filley (pp. 11, 12).

Bulletin of the Chinese Botanical Society is being published in June and December at Peiping. Both original articles and abstracts of papers appearing in other Chinese publications are included, the use of English, German, or French being required in all cases. Among those in the initial number is one entitled A Study of the Growth of Soil Fungi and Pathogenic Fungi on Tomatoes and Grapes, by R. Ma (pp. 73–77).

Revue d'Immunologie is being published bimonthly at 120 Boulevard St.-Germain, Paris. The initial number contains six original articles, among them Parallel Between Induced and Spontaneous Anaphylaxis [trans. title], by P. Vallery-Radot and G. Mauric (pp. 74–84).

Der Forschungsdienst is being published biweekly at Neudamm and Berlin as a successor to *Deutschen Landwirtschaftlichen Rundschau.*

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EXPERIMENT STATION RECORD

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THIRD TRIENNIAL CONFERENCE OF THE ASSOCIATED COUNTRY WOMEN OF THE WORLD

A unique gathering of much interest to all who are concerned with the betterment of country life convened in the National Capital from May 31 to June 11, 1936. This was the third triennial conference of the Associated Country Women of the World, "an international organization which links together for educational purpose and in friendly and helpful relations rural women's organizations and individual countrywomen." Assembling for the first time on American soil, it brought together over 7,000 women, mostly from 46 States of the Union and the District of Columbia, but also including representatives of all provinces of Canada and 66 official overseas delegates from lands as remote as Ceylon, South Africa, and New Zealand. For these and other reasons, its sessions attracted widespread attention.

The attendance far exceeded all expectations, as the organization is relatively young. Following a preliminary meeting in London in 1929, its first triennial conference was held in Wien (Vienna) in 1930 and its second conference in Stockholm in 1933. By 1935 30 countries had become represented in its membership, and efforts were begun to hold a meeting in the United States, where it had not been particularly well known.

On March 19, 1936, an act was signed by President Roosevelt authorizing an appropriation of $5,000 to aid in defraying the conference expenses, and plans were rapidly pushed to completion under the sponsorship of the United States member organizations. These included the Women's National Farm and Garden Association, the National Master Farm Homemakers' Guild, the Associated Women of the American Farm Bureau Federation, the Country Gentlewoman League, the New England Farm and Garden Association, and State federations and home bureaus, home demonstration clubs, and similar groups in New York, Illinois, North Carolina, Kentucky, Virginia, South Carolina, West Virginia, Kansas, and Missouri.

There was also available direct cooperation and leadership from the Extension Service of the United States Department of Agriculture, Miss Grace E. Frysinger, senior home economist, serving as chairman of the United States hostess groups, and other members of the staff rendering much assistance.

Official interest in the conference was strongly in evidence, with greetings from the President of the United States, the Secretary of State, and the Secretary of Agriculture. A garden party reception was given in its honor at the White House by the President and Mrs. Roosevelt, and the latter also addressed the opening session, attended others, and in various ways manifested her approval of its undertakings and aims.

The proceedings in the general sessions were planned primarily to acquaint those present with what is being done in the various countries by and for rural women. The program included reports by the delegates and committees and generous opportunity for discussion, and the presentation to the conference of volume V of its series on What the Country Women of the World Are Doing, this volume dealing with Food in Its Relation to the Country Home. There were also two sessions for sectional discussions. The first of these dealt with such topics as art in rural life, the drama, education for country life, handicrafts, health and library services in rural areas, motion pictures, music, folk dancing, and folk singing, organizations for rural young people, the radio, and the study of local history. The second series took up the countrywoman and the economic problem, the countrywoman's use of rural resources, electricity in rural life, the marketing of home products, rural unemployment and readjustment, and town people in the country. Much stress was laid on education for rural living, and the executive committee was empowered to investigate in cooperation with scientific research the problem of health in relation to nutrition.

Special mention should be made of the comprehensive exhibits of American and foreign handicrafts and homemaking which had been arranged and of a large amount of other illustrative material which had been assembled by Federal and State agencies. At the auditorium of the Department of Agriculture the cooperating agencies were the Department's own Bureaus of Home Economics and Agricultural Economics and the Office of Information, the Federal Department of Labor, the Federal Home Loan Banks, the Resettlement Administration, the Federal Housing Administration, the Rural Electrification Administration, the Public Health Service, and the Works Progress Administration. At the Government auditorium, where most of the general sessions were held, booths were arranged by the extension service of eight States. That of New Hampshire

dealt with clothing, New York with the living room, New Jersey with community enterprises, Maryland with farm women's markets, Virginia with foods and nutrition, West Virginia with beautifying the farm grounds, Ohio with the home management kitchen, and Michigan with child development. In this way was exemplified a prediction by the president of the organization, Mrs. M. R. Watt of Canada, that delegates from other lands would "learn at first hand how the cooperation between State and colleges and farm women has made practical the finest system of bringing education to the home of any country in the world."

The conference was of direct interest and value to the thousands of farm women in attendance, bringing them a new vision, a broader outlook, and a consciousness of group solidarity. In the words of one of the speakers, "for the first time in the Nation's history the farm woman's voice has been unmistakably heard in Washington." Thus a notable service was rendered in giving to rural women at home and abroad what Mrs. Watt expressed as "a national and international standing to which they are entitled but do not often get." Among the most conspicuous contributors in this direction was President Roosevelt, who pointed out that "people are prone to forget that by far the greater part of the world's population is actively engaged in agriculture or is directly dependent on the results of agriculture."

An even broader significance was noted by Secretary Wallace, who declared that "it is no exaggeration to say that during the next generation or two the farm women of the world will be a determining factor in our civilization. To an increasing extent both the quantity and the quality of our population will depend upon them. If a great majority of them are to be condemned to unremitting drudgery, denied household conveniences common to most city homes, denied the opportunity for leisure and recreation and cultural activities—if this is to be the program for the rural women of the world—then we cannot expect either the material or the spiritual progress we wish to see in the coming generations. If, on the other hand, not merely 30 to 40 percent but 80 to 90 percent of our farm women can have the household conveniences and the cultural opportunities they ought to have, along with improvement in the general economic position of agriculture, then the future for farm women and for our civilization is immeasurably brighter."

From many angles the conference was a thoroughly worthwhile occasion, and one which seems certain to be both immediately stimulating and permanently helpful to all who came within its influence.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical investigations by the Nebraska Station] (*Nebraska Sta. Rpt. [1935], pp. 7, 8*).—Progress is noted on the preparation and study of the cereal glutelins and the enzymes of wheat flour as related to flour grade and baking characteristics.

The effect of heat and hot alcohol on liver proteins, W. H. SEEGERS and H. A. MATTILL (*Jour. Biol. Chem., 110 (1935), No. 3, pp. 531–539, fig. 1*).—A carefully dried preparation of beef liver heated at 100° C. for 2 weeks was found to be well digested, whereas heating at 120° for 72 hr. or hot alcohol extraction for 130 hr. lowered the digestibility very markedly. The acid hydrolyzates of dried whole liver, of heated liver, and of hot alcohol-extracted (130 hr.) liver gave approximately equal growth rates and had the same biological values and digestibilities when they were fed as the source of nitrogen with tryptophan.

"It is believed that the low biological value of these alcohol-extracted or heated liver preparations is the result of a decreased digestibility such that the resulting amino acid proportions are not representative of the original protein."

The effect of variations in ionic strength on the apparent isoelectric point of egg albumin, E. R. B. SMITH (*Jour. Biol. Chem., 108 (1935), No. 1, pp. 187–194, figs. 4*).—This investigation has shown that the apparent isoelectric point of ovalbumin, cataphoretically determined, is inversely related to the ionic strength of the buffer used and to the concentration of the protein present. Extrapolation of apparent values for the isoelectric point of ovalbumin in 0.1 percent solution in citrate, phthalate, and acetate buffers to 0 ionic strength gave an isoelectric point of pH 4.85±0.01. Citrate buffers produced a greater depression in the apparent isoelectric point than did phthalate or acetate solutions of the same ionic strength. Extrapolated values for the isoelectric point of 1 percent albumin, determined by cataphoresis or by minimal pH change, agreed at pH 4.82±0.01. With 2 percent protein the isoelectric point at 0 ionic strength was found to lie at pH 4.79±0.01. Values for the isoelectric point at the three albumin concentrations studied yielded a straight line when plotted against the protein concentration. "The intercept of this line at 0 protein concentration gives a 'true' isoelectric point of 4.86±0.01."

Thyroglobulin studies.—I, The thyroxine and iodine content of normal and goitrous human thyroglobulin, J. W. CAVETT, C. O. RICE, and J. F. MCCLENDON (*Jour. Biol. Chem., 110 (1935), No. 3, pp. 673–683*).—It has been shown at the University of Minnesota that thyroglobulin from goiters contains less thyroxine and nonthyroxine iodine (diiodotyrosine) than thyroglobulin from normal human thyroids.

"This is not due to splitting off of iodine in the purification, because the percentage of iodine increased as the purification proceeded, nor to admixture of noniodized impurities (nucleoprotein), as the phosphorus content was low and fairly constant, —0.02 percent. Therefore, goiter is associated with

abnormal thyroglobulin. Judged from thyroglobulin there is only one type of goiter, and the great difference in goiter types should be sought elsewhere than in thyroglobulin.

"The basal metabolic rate of the individual had no relation to the thyroxine content of the thyroglobulin from colloid goiter and adenomatous glands, but for the exophthalmic glands the general trend was for the basal metabolic rate to be the highest when the thyroglobulin contained the least thyroxine."

The effect of X-rays on glutathione, V. E. KINSEY (*Jour. Biol. Chem., 110 (1935), No. 3, pp. 551–558, figs. 2*).—At the University of Pittsburgh, X-rays were found to have a destructive effect on aqueous solutions of glutathione, a linear relation between the extent of the destruction and the dose employed having been observed.

"The deleterious effects of X-rays increase linearly with the concentration from 0.001 to 0.01 percent glutathione, and above this concentration again increase linearly but at a lesser rate. Augmented destruction was found with increasing pH values. No effect was observed when glass capillaries were placed in the solutions to determine possible adsorption effects of the walls of the Pyrex glass test tubes used for containers."

The energy efficiency of the destruction of glutathione was determined for various concentrations and was found to increase as the concentration.

Derivatives of d-galacturonic acid, I, II (*Jour. Biol. Chem., 108 (1935), No. 3, pp. 763–771; 110 (1935), No. 3, pp. 719–725*).—The ultimate purpose of this research of the Wisconsin Experiment Station, of which the first results are dealt with in the two papers here noted, "is to prepare from the acyl derivatives halogenated compounds which can be used for the synthesis of glycosides and aldobionic acids."

I. *Esterification and acylation of d-galacturonic acid,* S. Morell and K. P. Link.—Direct acetylation, or benzoylation, of either *d*-galacturonic acid or its α-methylglycoside did not yield crystalline products; but, in the form of its methyl ester, α-methyl-*d*-galacturonide yielded crystalline triacetyl and tribenzoyl derivatives. The methyl ester of *d*-galacturonic acid was obtained by means of the reaction with diazomethane. It crystallized in the α form. Acetylation of methyl-α-*d*-galacturonate produced a crystalline tetraacetate of which the properties indicated the structure to be that of α-1, 2, 3, 4-tetraacetyl methyl-*d*-galacturonate; benzoylation yielded the corresponding α-1, 2, 3, 4-tetrabenzoyl derivative.

II. *The synthesis of α-acetobromo-d-galacturonic acid methyl ester and its conversion to β-methyl-d-galacturonide,* S. Morell, L. Baur, and K. P. Link.—The conversion of *d*-galacturonic acid to β-methyl-*d*-galacturonide by means of the Königs and Knorr glycoside synthesis is described in full experimental detail. α-Acetobromo-*d*-galacturonic acid methyl ester was prepared from the corresponding tetraacetate. When the acetobromo compound was treated with methyl alcohol and silver carbonate, triacetyl-β-methyl-*d*-galacturonide methyl ester was formed. The latter yielded β-methyl-*d*-galacturonide on saponification. All of the compounds were obtained in crystalline form and in good yields.

Preparation of acetphenetidin from p-aminoacetanilid, H. L. HALLER and G. L. KEENAN (*Jour. Assoc. Off. Agr. Chem., 17 (1934), No. 3, pp. 512–516*).—In a synthesis devised at the U. S. D. A. Bureau of Chemistry and Soils, acetphenetidine was prepared from acetanilide by the following sequence of reactions: Acetanilide→*p*-nitroacetanilide→*p*-aminoacetanilide→*p*-acetaminophenyl diazonium borofluoride→*p*-acetoxyacetanilide→acetphenetidine.

The isolation and characterization of a starch polysaccharide from the woody tissue of the apple tree (Malus malus), C. NIEMANN, R. H. ROBERTS,

and K. P. LINK (*Jour. Biol. Chem., 110 (1935), No. 3, pp. 727–737*).—In an investigation reported from the Wisconsin Experiment Station, a starch polysaccharide has been isolated from the woody tissue of mature branches of the apple tree (*M. malus*). This polysaccharide was found to be essentially identical in structure to the β-amylose present in the common cereal and tuber starches.

Of the isolation method used, it is noted, in part, that "since the physical methods commonly used for isolating starch from tubers and cereals cannot be applied to woody tissue, it is practically impossible to obtain wood starch in its natural granular form. However, the starch can be isolated in an amorphous condition with the aid of dispersing agents. . . . We have found that hot dilute ethanol can also be used to disperse the starch after the plant tissue has been suitably pretreated with an acid-alcohol reagent.

"In this procedure the starch-containing tissue is refluxed for 30 min. with a solution of 85 percent ethanol containing 1 percent nitric acid. During this time the starch granules remain intact within the cells, but a considerable portion of the tissue is removed by solution in the reagent. Although the starch granules are neither destroyed nor removed by the treatment, their envelopes appear to have been weakened, possibly by an incipient rupture at the hilum. When the acid-alcohol-treated tissue is refluxed with 20 percent ethanol the weakened granules do not swell but rupture, and then disperse in the aqueous ethanol mixture. This solution, containing the dispersed starch polysaccharide, is separated from the tissue residue by filtration, and from this neutral and salt-free extract the starch is recovered in an amorphous condition by precipitation with 95 percent ethanol."

Chemical composition of juice from Louisiana sugarcane injured by the sugarcane borer and the red rot disease, N. MCKAIG, JR., and C. A. FORT (*Jour. Agr. Res. [U. S.], 52 (1936), No. 1, pp. 17–25*).—Injury either by the borer or by the red rot disease caused a decrease in juice extraction and in the percentage of solids and sucrose in the juice obtained. The apparent and the true purity were correspondingly lowered. The percentages of reducing sugars, ash, gums, alcohol-precipitable nonsugars, and total organic nonsugars were significantly increased. The content both of protein and of nonprotein nitrogen compounds was increased, especially the latter. A greater increase in the nitrogen content of the sirups resulted. In the ash, the potassium content was increased somewhat more than was the content of the other elements, although all the mineral constituents of the juice were increased. When calculated to percentage of the ash, the ratios between the different components were but slightly altered. The color and the turbidity of the clarified juices and sirups were decidedly increased. A comparison of four varieties commercially grown in Louisiana indicated that, in general, the changes in the chemical composition of the juice were greater in the case of the highly susceptible variety P. O J. 213 than in those of the other varieties tested.

A study of the concentration and properties of two amylases of barley malt, M. L. CALDWELL and S. E. DOEBBELING (*Jour. Biol. Chem., 110 (1935), No. 3, pp. 739–747, figs. 2*).—This contribution from Columbia University describes a method for the separation and simultaneous concentration of two amylases in different fractions obtained from the same extracts of barley malt without appreciable losses of either type of activity at any given stage.

After purification, both amylases rapidly lost their activities upon being heated in aqueous solutions and exhibited no marked differences in this property. Both types, when highly purified, were free from carbohydrate but gave positive protein color reactions. Comparative studies of the course of the hydrolysis of starch by the two types of purified products made it evident that the amylases catalyze the hydrolysis of amyloses in a different manner.

In the presence of 0.01 M acetate and in measurements at 40° C., H-ion activities corresponding to pH values of 4.3 to 4.6 were favorable to the saccharogenic action of both amylases of barley malt. "Under similar conditions, the amyloclastic action of the amylase with a preponderance of this activity is also favored by H-ion activities corresponding to pH 4.3 to 4.7." the same H-ion activities were favorable to the action of both amylases throughout the course of the hydrolysis of starch as well as in measurements of relatively short duration.

The measurement of phenolase activity, R. SAMISCH (*Jour. Biol. Chem., 110 (1935), No. 3, pp. 643–654, figs. 5*).—A number of variables involved in the oxidation of phenols by gaseous oxygen in the presence of plant phenolase have been studied at the University of California.

An increase in the partial pressure of oxygen up to 60 to 70 percent O_2 increased the rate of enzymatic oxidation under the conditions of the experiment. Increase in the concentration of the substrate increased the oxygen absorption up to an optimum concentration beyond which additional substrate inhibited enzyme activity. The pH activity relation was found to be a function of both the nature of the substrate and the source of the enzyme extract. The halides of neutral salts inhibited oxidase activity inversely to the atomic number. Phenolase activity is partially destroyed even at very moderate temperatures by a reaction which seemed to be chemical in nature rather than a heat coagulation.

The author proposes a phenolase unit which has as the phenolase number the velocity constant $K=(O_2 \text{ absorbed}/\log t)$, when measured under the following standard conditions: (1) in an atmosphere of pure oxygen, (2) at a temperature of 25°, (3) at the optimum pH, and (4) at the optimum substrate concentration.

A direct-reading pH meter for glass, quinhydrone, and hydrogen electrodes, A. HEMINGWAY (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 3, pp. 203–205, fig. 1*).—It is shown that, with the use of the glass electrode circuit described in this contribution from the University of Minnesota, "the pH measurement is simple, involving only a preliminary standard cell and standard buffer adjustment with appropriate dial settings and operation of the proper switches. . . . A simple pH measurement can be made in about 10 min., including the time required for the constancy of the filament and batteries. Once in adjustment, repeated measurements can be made in 1 min. No temperature calculation is necessary. This is taken into consideration by the variable calibrated resistors in parallel and in series with the slide wire and coils. It is not necessary to know the value of the voltage of the calomel half-cell, the quinhydrone half-cell, nor the asymmetric potential. This remains constant for a given temperature and is balanced out by the accessory potentiometer. The main potentiometer balances the membrane potential, which varies directly with the pH.

"In order to use the instrument for measuring quinhydrone and hydrogen-electrode potentials, switches and binding posts are provided." A constructional diagram and the manipulative detail of the instrument are given.

A microquinhydrone electrode: Its application to the determination of the pH of glomerular urine of necturus, J. A. PEERCE and H. MONTGOMERY (*Jour. Biol. Chem., 110 (1935), No. 3, pp. 765–775, fig. 1*).—The authors have devised a microquinhydrone electrode with which reliable determinations of pH can be made in 0.1 mm^3 of fluid or less. The electrode can be inserted through or into tissues without contamination, and escape of CO_2 from the fluid which is brought into contact with it is prevented. Its accuracy is shown to be of the same order as that of the ordinary quinhydrone electrode

A piece of 36-gage platinum-iridium wire is encrusted at its tip with quinhydrone from a saturated solution in redistilled acetone. The wire is then mounted, by means of a very small drop of de Khotinsky cement placed 1 or 2 cm from the coated tip, in a quartz micropipette about 0.5 mm in internal diameter and drawn to a very small blunt point. The capillary pipette and the larger tube into which it is cemented are filled with mercury, the device is held firmly in the micromanipulator, and, by withdrawing mercury, a minute quantity of the liquid of which the pH value is to be measured is drawn into the quartz capillary about the coated tip of the electrode.

The application of the microquinhydrone electrode to the determination of the pH of the aqueous humor of rachitic and normal rats, J. A. PIERCE (*Jour. Biol. Chem., 111 (1935), No. 2, pp. 501–506*).—Determinations of the pH of aqueous humor of rats, made by means of the Pierce and Montgomery microquinhydrone pipette electrode, have demonstrated a significant difference between that of rachitic and normal animals. A temperature correction to apply to low protein-containing biological fluids was found unnecessary. The presence of an interfering "membrane potential" was not detectable.

Manometric manostat, G. B. BACHMAN (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 3, p. 201, fig. 1*).—An apparatus in which a mercury manometer indicates, and (through a comparatively simple electrical circuit including a single 71–A radio tube) controls the pressure in attached apparatus within the range of 1 to 850 mm, is described in a contribution from the Ohio State University. The device "is particularly convenient for maintaining a given pressure either below or slightly above atmospheric pressure during distillations."

An improved slow-combustion pipet for gas analysis, D. J. PORTER and D. S. CRYDER (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 3, pp. 191, 192, fig. 1*).—A contribution from the Pennsylvania State College describes and illustrates the design of an apparatus free from the disadvantages of incomplete combustion, flash back, and explosion; describes the operation of the modified instrument; and presents data illustrative of its satisfactory performance.

A simple rotating ball mill, A. H. FURNSTAL (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 5, pp. 342, 343, fig. 1*).—The apparatus here described was devised at the University of California to meet the need for a "simple, compact, efficient, and portable" machine. The mill "consists of two horizontal rotating shafts upon which is placed a cylindrical container made of steel or glass, holding the material to be pulverized, and rotated by the revolving shafts. The mill may be easily constructed at a small cost in the average laboratory. Many substances, such as soils, pure minerals, plant materials, bacteria, glass, etc., have been ground in this mill."

The 0.5-in. steel shafts are covered with rubber tubing to improve the traction and reduce noise. The two shafts are belted together at one end by 2-in. pulleys and round belting, and one is belted to a motor of about 0.25 hp. at the other end of the apparatus by a larger pulley. "The grinding chamber is made of a steel tube 3.25 in. in diameter by 3.75 in. long, machined on the inside and ends, as illustrated. The ends are steel plates 3.5 in. in diameter by 0.25 in. thick, turned and grooved to fit the chamber. A hole was drilled and threaded in the center of one plate to fit a 0.375- by 4.5-in. steel rod threaded at both ends. The center of the other plate was drilled with a slightly larger hole. A nut was screwed on the outside of the rod, which runs through the center of the chamber, tightening the two plates against the turned steel tube. The plates and steel tube should be machined carefully; otherwise, the mill will not retain finely divided material." Three-fourths in. ball bearings were effectively used as grinding balls. Ordinary cork- or rubber-stoppered

bottles from 3 to 5 in. in diameter and provided with 0.75-in. glass marbles as grinding balls were also found effective.

An electric heater designed to prevent losses from creeping in the evaporation of concentrated salt solutions preliminary to mineral analysis, G. M. GUEST and E. LEVA (*Jour. Biol. Chem., 110 (1935), No. 3, pp. 777–779, fig. 1*).—In the apparatus described, the liquid to be evaporated is heated by means of a circular electrically heated coil made to fit closely around the brim of the vessel containing the liquid. The apparatus illustrated was designed for the use of 30-ml platinum crucibles, "but the use of other sizes and types of vessels (glass or quartz beakers, for example) requires only a change in the dimensions, diameter, and depth of the aperture in which the vessel is held. In use, the vessel should be filled not more than two-thirds full, so that the heated ring of vessel wall at the brim is well above the surface of the liquid. As heat from the coil is applied, gently at first and slowly increased by means of a rheostat control, vaporization takes place from the edge and surface of the liquid, and evaporation progresses without visible trace of ebullition or sputtering. As the solution becomes increasingly concentrated and the surface film creeps upward from the edge of the liquid, the creeping film encounters the hottest part of the vessel wall near the brim and is either driven downward or vaporized, never passing the heated ring of vessel wall. In our own experience, a sample of 5 ml of blood, digested in a Pyrex ignition tube with 5 ml of sulfuric acid, transferred to a 30-ml platinum crucible with rinsing (giving about 20 ml of liquid), may be carried through the successive stages of evaporation of water, concentration, appearance of sulfuric acid fumes, and of finally obtaining the dry salts, in from 1 to 1.5 hr."

Buret assembly for standard reducing solutions, C. J. SCHOLLENBERGER (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 3, pp. 199, 200, fig. 1*).—The apparatus described uses a standard burette so attached to the remainder of the assembly that it can readily be removed for cleaning. The automatic zero point is so made as to permit its accurate adjustment. The apparatus includes an inert gas generator to permit the storage of reducing solutions out of contact with oxygen in the reservoir of the burette.

Destruction of organic matter in plant material by the use of nitric and perchloric acids, J. E. GIESEKING, H. J. SNIDER, and C. A. GETZ (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 3, pp. 185, 186*).—In an investigation carried out at the University of Illinois plant materials were found to be oxidized suitably for calcium, magnesium, potassium, and phosphorus determinations by means of perchloric acid following a pretreatment with nitric acid. The pretreatment with nitric acid was found necessary because "hot concentrated perchloric acid may react violently with organic substances." The following procedure is prescribed for the oxidation of a wide variety of plant samples:

Place a 4-g sample of the material to be oxidized in a 400-ml beaker and add 10 ml of nitric acid (sp. gr. 1.42). Cover the beaker with a watch glass and heat gently until any rapid initial reactions have subsided. Then heat to boiling and boil until the contents of the beaker are almost dry. Remove the beaker from the hot plate and add 10 ml of dilute nitric acid (1 to 1) and 10 ml of perchloric acid (70 to 72 percent). Replace the cover glass and heat very gently to boiling (avoid superheating). Maintain this temperature until all organic material has been removed from the sides of the beaker and from the solution, which will be indicated by a colorless or slightly colored solution. Remove the cover glass, allow the beaker to cool a few minutes, and wash any adhering salts into the beaker. (If the cover glass is washed with perchloric acid, the contents of the beaker need not be cooled.)

Evaporate to dryness at a temperature just below the boiling point in a clean hood. If potassium is to be determined in the residue, remove the ammonium salts and add 5 ml of hydrochloric acid (1 to 1) and 10 ml of water. Heat until all salts are dissolved. Filter into a suitable volumetric flask. Wash the silica residue thoroughly with hot water and make the filtrate up to volume.

Determination of water, E. v. MIGRAY (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 5, p. 348*).—The method involves (1) distillation of the material with xylene or toluene, (2) dehydration of the distillate with a weighed quantity of anhydrous copper sulfate, filtration, and washing of the copper sulfate with benzene and ether with subsequent drying in vacuo, and (3) calculation of water from the increase in weight of the copper sulfate.

"The method is applicable to the determination of water in any product which loses its water at 110° to 140° C. and yields no other volatile compounds that act on copper sulfate or are insoluble in benzene and ether. The determination can be carried out either as a macro- or a micro-method. . . . The frothing of fatty alcohol sulfonates and highly sulfonated oils during distillation can be avoided by the addition of dry sodium chloride to the distillation flask."

Semimicro determination of halogens in organic compounds, E. P. CLARK (*Jour. Assoc. Off. Agr. Chem., 17 (1934), No. 3, pp. 483–487, figs. 4*).—The semimicro methods for the determination of halogens in organic compounds, described in this contribution from the U. S. D. A. Bureau of Chemistry and Soils, "are the results of numerous experiments in which semimicro technic was applied to various standard macro methods. From the standpoint of general applicability, rapidity, accuracy, and simplicity they are considered satisfactory and are presented here for consideration as possible material for inclusion in the Official methods of the A. O. A. C."

Chlorine and bromine are determined by the Carius method. The procedure is essentially the same as that used in the macro system except that approximately 25 mg samples are employed, "which entails a corresponding refinement in weighing the sample and the resulting silver halide and the use of apparatus of appropriate size." The electrically heated aluminum bomb furnace, with heat insulation of magnesia pipe covering, is described.

The same method gave good results with all iodine compounds tried, but in the case of aliphatic compounds of iodine a more rapid and convenient procedure, based upon treatment of the aliphatic iodine with bromine to form iodine bromide and the further action of bromine and water to form iodic and hydrobromic acids, was developed.

Volumetric microdetermination of chloride and potassium ions, B. BULLOCK and P. L. KIRK (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 3, pp. 178–180*).—A contribution from the University of California describes "an easy and entirely satisfactory method for the determination of potassium in any medium to which the standard chloroplatinate method is applicable," the principle involved being that of the reduction of the platinum in the precipitate to the metallic state by use of metallic magnesium in neutral solution, and the titration of the chloride released with silver nitrate, using dichlorofluorescein as indicator, in the presence of a volume of acetone about equal to that of the sample solution. The method was shown to determine satisfactorily the potassium content of 1 or 2 ml of 0.01 or 0.005 N potassium chloride solutions.

Volumetric determinations of halides, K. BAMBACK and T. H. RIDER (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 3, pp. 165, 166*).—Dichlorofluorescein was used as an adsorption indicator in the argentometric titration of

organic hydrochlorides dissolved in alcohol, and inorganic halides in alcohol or aqueous solutions. The analytical results agreed within experimental error with the theoretical values for pure chemicals and with the values obtained by the standard Volhard procedure for chemicals of ordinary commercial purity. Possible further applications of the method are suggested.

Zinc cobaltinitrite for the detection of potassium, J. ADAMS, M. HALL, and W. F. BAILEY (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 5, pp. 310, 311*).—The object of the experiments here recorded was to precipitate potassium in such a manner as to permit the subsequent determination of sodium by means of the zinc-uranyl-acetate reagent. "Zinc cobaltinitrite should answer the purpose, since the added zinc ion should decrease the solubility of the sodium precipitate by common ion effect," but some difficulty in preparing the necessary zinc compounds was encountered. The method of preparation finally adopted was to pass a rapid stream of oxides of nitrogen, made by the action of concentrated nitric acid on copper foil, through a solution saturated with both cobalt acetate and zinc acetate for from 45 to 60 min. The resulting dark brown solution was tightly stoppered, allowed to stand overnight, and then decanted from any precipitate. If kept tightly stoppered to prevent loss of oxides of nitrogen, the solution was as sensitive as ever after 6 weeks; left open to the air, all cobaltinitrite disappeared within a week.

Of the sensitivity of the method it is noted that "repeated tests showed that 1 mg of potassium per milliliter gave an immediate yellow precipitate. After standing for 15 min., from 0.4 to 0.6 mg per milliliter was the smallest amount detectable. Sodium in amounts up to 50 mg per milliliter seemed without effect on the sensitivity. Solutions containing both sodium and potassium nitrates were treated with zinc cobaltinitrite until all the potassium was removed and then tested for sodium by zinc-uranyl-acetate reagent prepared according to Reedy. After removal of 50 mg of potassium per milliliter 3 mg of sodium per milliliter were detectable by the formation of a distinct yellow-green precipitate. When the amount of potassium was 10 mg per milliliter, 1 mg of sodium could be detected in the filtrate."

Loss of water-soluble potash in fertilizer mixtures, W. H. ROSS, K. C. BEESON, L. M. WHITE, and A. R. MERZ (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 5, pp. 305–308*).—In an investigation conducted at the U. S. D. A. Bureau of Chemistry and Soils it was found that the extraction of mixed fertilizers containing superphosphate as directed in the official procedure for determining available potash does not recover all the water-soluble potash incorporated in the mixture. This result was traced to occlusion or adsorption of a small portion of the potash in the basic iron and aluminum phosphates formed during the extraction.

"The loss of potash varies with the iron and aluminum content of the superphosphate in the mixture and is greater when the mixture contains potassium sulfate than when it contains potassium chloride. A loss of potash occurs in mixtures that contain an old superphosphate as well as in those that contain a freshly prepared superphosphate, and the loss of potash in mixtures that have been allowed to stand for a month is greater than in day-old mixtures. For mixtures that are a month or more old the loss of potash amounts to about 1.5 percent of the total potash present."

Composition and properties of superphosphate, I, II (*Jour. Assoc. Off. Agr. Chem., 17 (1934), No. 3, pp. 487–505, figs. 2; 18 (1935), No. 2, pp. 244–260, figs. 2*).—This is a contribution from the U. S. D. A. Bureau of Chemistry and Soils.

I. ***Determination of water in superphosphate and the relation between free water and free acid,*** W. L. Hill and K. D. Jacob.—The authors discuss the

principal constituents of superphosphate and of the superphosphate solution, the relation between the hygroscopic or free water and the free acid, and that of the composition of the superphosphate solution to the determination of water. They also state the results of an extensive study of several methods for determining water in superphosphate, viz, (1) drying methods, including oven drying and desiccator methods, (2) distillation methods, and (3) extraction methods, in which alcohol or ether is used as extractant.

"The results show (1) that the hygroscopic water in superphosphate can be most satisfactorily determined by the ether-extraction method, which also permits the simultaneous determination of the free acid, and (2) that the water of crystallization can then be determined by drying the ether extracted sample in the oven at 120° C."

II. *Free acid in superphosphate*, W. L. HILL and K. C. BEESON.—This is a study of (1) the composition of superphosphate solutions, (2) the relation between the age and the free acid content of superphosphate, and (3) existing methods for determining free acid by extraction with organic liquids. Ether, absolute alcohol, 95 percent alcohol, acetone, and ethyl formate were used as extractants under carefully standardized conditions in determinations of the free acid in standard equilibrium mixtures of monocalcium (alco dicalcium) phosphate and aqueous phosphoric acid and in representative samples of commercial superphosphates.

The results showed that, with the possible exception of ethyl formate, these extractants are capable of giving good results over the ranges of free phosphoric acid and free water that are usually encountered in commercial superphosphate not treated with ground limestone or other "conditioners."

The alcohol extracts of these samples contained no fluorine, whereas the acetone and ether extracts nearly always contained small quantities. The fluorine in the acetone extracts of the superphosphates reported upon varied from 0.000 percent in a very old material to 0.01 percent in the freshest material analyzed. The percentages of fluorine found in the ether extracts ranged from 0.01 to 0.02, the fresher materials showing the greater amounts of fluorine.

Digesting biological materials for calcium and phosphorus analysis, H. W. GERRITZ (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 3, pp. 167, 168*).—According to a contribution from the Washington Experiment Station, "weighed samples of suitable size are placed in 500-ml Kjeldahl flasks. Twenty to 30 ml of concentrated nitric acid are added and the flasks are placed on asbestos gauzes over medium flames. The contents are boiled gently with frequent mixing until the samples pass into a semicolloidal solution. The particles of material become swollen and gel-like, then disintegrate, producing a finer suspension or a solution. Experience will indicate at what time this occurs, and the speed of the digestion may be accelerated materially by determining the length of time required for the material being analyzed to reach this stage. For the materials reported in this paper the flames were so adjusted that the treatment took 30 to 45 min. Heating to dryness must be avoided.

"Ten ml of 70 percent perchloric acid are now added to each, and the flasks are placed over free flames. Very low flames are necessary during the perchloric acid oxidation; best results are obtained when just sufficient heat is applied to keep the solution boiling. Only a fine point of the flame should impinge on the flask. Higher temperatures tend to drive off the perchloric acid without materially accelerating oxidation.

"When fuming begins, the flame is so adjusted that only a trace of the perchloric acid fumes reaches the upper region of the Kjeldahl neck. The heating is continued until the solution is practically colorless or only a faint yellow color remains. The solution is allowed to cool slightly and 50 ml of distilled

water are added. Vigorous boiling occurs which drives out the remaining nitrogen dioxide fumes, leaving a clear solution.

"The solution is filtered into a volumetric flask, and the Kjeldahl is thoroughly washed with distilled water. When the solution has cooled it is made to volume and aliquots are taken for analysis."

The determination of iron in biological materials, G. E. FARRAR, JR. (*Jour. Biol. Chem., 110 (1935), No. 3, pp. 685–694*).—"The advantages of the procedure described here are: (1) The use of the specific thiocyanate color reaction for iron; (2) the satisfactory use of the simple dry ignition method by (a) the use of calcium carbonate to prevent volatilization of ferric chloride and (b) the hydrolysis of pyrophosphates formed during ignition; (3) the small number of easily purified reagents employed; (4) the elimination of the interference of both pyro- and ortho-phosphates; (5) the small number of simple manipulations required, precipitations and filtrations being avoided; (6) the ease and accuracy with which the oxidizing and acid condition of the solution for ferric thiocyanate color development are controlled and the minimum of extraneous substances present in this final solution."

Full manipulative detail is given, with all precautions necessary to accurate results.

Volumetric determination of iron in leather, G. F. SMITH and V. R. SULLIVAN (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 5, pp. 301–305, figs. 2*).—In a procedure devised at the University of Illinois the principal oxidant used for the destruction of the organic matter is a mixture of 2 volumes of 70 to 72 percent perchloric acid with 1 volume of 80 percent sulfuric acid. This mixture is either preceded by or mixed with concentrated nitric acid; and if chromium compounds are not present in the sample, from 20 to 25 mg of potassium dichromate are added to serve as an indicator of the completion of the oxidation. The green color of the reduced chromium changes, after the completion of the oxidation, to an orange color due to hexavalent chromium.

"Separations are unnecessary, as hexavalent chromium is reduced by boiling with hydrochloric acid, and the iron may then be determined by direct reduction with standard titanous chloride solution and ammonium thiocyanate as indicator. If desired, iron may first be separated from hexavalent chromium by precipitation with ammonia and then determined with titanous chloride."

Estimation of chloramine in water supplies, P. D. MCNAMEE (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 5, pp. 333, 334*).—The authors of this contribution from the U. S. Public Health Service note that "when sufficiently acidified, a solution of monochloramine is converted to nitrogen trichloride according to the equation $3NH_2Cl+2H^+ \rightarrow 2NH_4+NCl_3$"; and that such reaction may proceed in accordance with the two steps: $2NH_2Cl+4HCl \rightarrow 2NH_4Cl+2Cl_2$ and $NH_2Cl+2Cl_2 \rightarrow NCl_3+2HCl$.

"As indicated by the above equations, the chloramine content of a solution may be measured by determining the amount of ammonium ion formed on acidification. When the pH of a monochloramine solution is lowered to 4.4 or below, two-thirds of the nitrogen present as chloramine is converted to ammonium ion. The chloramine-chlorine content is then obtained by multiplying the observed increase in ammonia-nitrogen by $3/2 \times 35.5/14$ or 3.8. When 59-ml Nessler tubes are used, the factor becomes 3.8/5 or 0.76, which for convenience may be considered 3/4. (The Nessler tube readings correspond to milligrams of nitrogen per liter when 10-ml samples are read.)"

Combination of catalysts to reduce digestion time in determination of nitrogen.—I, In organic compounds, C. F. POE and M. E. NALDER (*Indus. and*

Engin. Chem., Analyt. Ed., 7 (1935), No. 3, p. 189).—An experiment was carried out at the University of Colorado in the following manner:

"In each of a number of digestion flasks, 0.25 g of the organic compound was placed with 10 g of nitrogen-free potassium sulfate and 20 cc of concentrated sulfuric acid. To four of the flasks were added the following catalysts: (1) HgO, 0.5 g; (2) $CuSO_4.5H_2O$, 1 g; (3) HgO, 0.3 g; $CuSO_4.5H_2O$, 0.5 g and Se, 0.1 g; (4) the same ingredients as (3) with the addition of 1 cc of strong hydrogen peroxide every 5 min. until the solution cleared. The fifth flask contained no added catalyst. The contents of each flask were digested over electrically heated plates, all units of which were of the same construction and gave the same amount of heat. Each sample was heated until the liquid cleared." In the cases of 20 organic compounds the selenium-copper-mercury combination was markedly more effective than the others in reducing the time required for clearing. The hydrogen peroxide additional treatment did not pay for the additional expense and trouble.

As an example of the results obtained, benzidine required 5 hr. digestion in the unmodified Gunning-Kjeldahl method, 26 min. with the copper catalysts, 25 with the mercury, and 9 min. only with the copper-mercury-selenium mixture; found, 15.16 percent, theory, 15.21 percent.

Determination of ammonia and of amide nitrogen in plant tissue, G. W. PUCHER, H. B. VICKERY, and C. S. LEAVENWORTH *(Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 3, pp. 152–156, fig. 1).*—This contribution from the Connecticut [New Haven] Experiment Station describes a new, more accurate, and more dependable method. The paper is accompanied by a dimensioned constructional diagram of the distillation apparatus used.

"The ammonia present in plant tissues as ammonium ions—that is, the so-called free or preformed ammonia—has been determined since the time of Boussingault by distillation with magnesium oxide, preferable in vacuo. A study of the possibilities of interference from a number of commonly found plant constituents, and of the conditions under which this determination is frequently conducted, has led to the suggestion of a technic that depends upon distillation in vacuo with a borax-sodium hydroxide mixture used in conjunction with a phosphate buffer solution. The ammonia is then nesslerized and determined in a Pulfrich spectrophotometer. Under these conditions, interference from other substances is minimal. The new reagent is particularly designed for determinations of ammonia in solutions to which phosphate buffers have been added, as the use of magnesium oxide is then inadmissible; its convenience, however, suggests that it may be generally applied with advantage."

The drying of the material was found to require a rather close control of conditions to avoid losses of amide nitrogen amounting, in the case of a test sample having a glutamine content simulating that of natural leaf material, to more than 20 percent when the material was dried at from 85° to 86° C. during 2.5 hr. When samples were made of such size that they could be dried in 90 min. at from 68° to 69°, the loss was reduced to that of from 3 to 5 percent of the amide nitrogen.

The determination of cystine and cysteine in butyl alcohol extracts, W. C. HESS and M. X. SULLIVAN *(Jour. Biol. Chem., 108 (1935), No. 1, pp. 195–199).*—The authors find that an extraction of cystine from N HCl solution by butyl alcohol yields an alcohol layer containing 7.3 percent of the total cystine and an acid layer containing 92.5 percent of the total cystine. Three methods applied to both solvents accounted for 98.40, 99.19, and 101 percent, respectively, of the total cystine used. Extraction of cysteine from N HCl solution by butyl alcohol yielded an alcohol layer containing 40.8 percent of the total cysteine

and 54.2 percent in the acid layer. The Sullivan (E. S. R., 70, p. 444) and other methods applied to both solvents accounted for 95.0, 95.3, and 96.9 percent, respectively, of the cysteine used. "Both cystine and cysteine can be extracted quantitatively from butyl alcohol by 0.1 N NaOH. Cystine and cysteine can be determined quantitatively by the Sullivan method in experiments involving extraction with butyl alcohol."

The determination of glycine in proteins, A. R. PATTON (*Jour. Biol. Chem., 108 (1935), No. 1, pp. 267–272*).—The author has developed at the Minnesota Experiment Station a colorimetric method for the determination of glycine by means of its reaction with o-phthalic dialdehyde in slightly alkaline solution, with the formation, on acidifying the solution, of a green compound separable from the colored compounds formed from other amino acids by extracting it with chloroform. Only the compounds produced by tryptophan, the ammonium ion, or glycine affect the color of the chloroform extract, and the test could therefore be adapted to the colorimetric determination of glycine by hydrolizing the protein (3 g) in the presence of benzaldehyde (1 cc) to remove the tryptophan, and by distilling off the ammonia under diminished pressure in the presence of an excess of sodium bicarbonate.

"A much smaller sample of protein than 3 g may be used if necessary. The hydrolyzate must be neutralized with great care, since the ensuing color test is very sensitive to differences in reaction of the hydrolyzate. If the hydrolyzate is allowed to remain alkaline for a time before the buffer [M/15 phosphate, pH 8] is added, the amount of green color produced is considerably weakened. If, on the other hand, the solution remains acid after the buffer solution has been added, no color is produced by the glycine reagent. The omnipresent straw to brown color found in protein hydrolyzates does not interfere with the color test, because it does not dissolve in the chloroform layer which dissolves the green glycine compound. It was found that using the practically colorless zein hydrolyzate [in which no glycine has been found either by the colorimetric method or by direct isolation procedures] in the blank with added standard glycine solution gave a color which matched most proteins better than did standard glycine alone."

The estimation of starch, J. T. SULLIVAN (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 5, pp. 311–314*).—The author contributes from the Indiana Experiment Station a discussion of the difficulties involved in the determination of starches of various origins, finding, with respect to the numerous methods which have been proposed (reference is made to 47 papers), that "few of them are reliable even in limited cases. Neither acids nor diastatic enzymes are sufficiently specific for accurate results. The development of highly purified and specific enzymes may solve the problem. Methods based on other chemical and physical properties of starch, such as its solubility in salts and acids and its insolubility in iodine and salt solutions, deserve closer study, and no doubt many contributions will be made in the future along such lines."

Determination of the alkali-labile value of starches and starch products, T. C. TAYLOR, H. H. FLETCHER, and M. H. ADAMS (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 5, pp. 321–324, figs. 4*).—An analytical procedure based on the observation that "by measuring with hypoiodite the amount of material in a starch, amylose, or starch product that is attacked by hot aqueous alkali, a number could be obtained that was an index to the peculiar make-up of he sample in hand", has been elaborated at Columbia University.

Starch samples each of about 50 mg were treated for 1 hr. in a boiling water bath with exactly 10 cc each of 0.1 N sodium hydroxide, then quickly cooled and immediately treated with exactly 10 cc of 0.1 N hydrochloric acid. The reduction effected in an excess of standard hypoiodite solution was then

determined after a suitable reaction period under carefully specified conditions of reduction and back titration with thiosulfate.

Analysis of n-butanol, acetone, and ethanol in aqueous solution, L. M. CHRISTENSEN and E. I. FULMER (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 3, pp. 180–182*).—Methods suitable for the rapid routine analysis of aqueous solutions of *n*-butanol, acetone, and ethanol are described in a contribution from the Iowa State College. Acetone is measured by an iodometric method and the alcohols are measured by oxidation with dichromate and extraction with carbon tetrachloride, or by oxidation at two different concentrations of sulfuric acid in the oxidizing mixture. "The methods are equally accurate and rapid. For purposes of checking, a combination of the methods may be employed. As a means of proving the identity of the products, both the oxidation and the oxidation-extraction methods, taken in conjunction with measurement of specific gravity and the dipping refractometer reading, will prove of value."

Determination of alpha-amylase, S. JOZSA and W. R. JOHNSTON (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 3, pp. 143–146, fig. 1*).—By modifications of the experimental technic and a standardization of the liquefication curve, and by introducing a new type of enzyme unit termed the "liquefon", the authors "have been able to calculate accurate values for alpha-amylase activities from the measured amounts of liquefied starch. The enzyme-unit method of expression is of general applicability and has been successfully applied to the study of other enzymes."

Estimation of the saccharifying power of malt diastase, H. C. GORE and H. K. STEELE (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 5, pp. 324–326*).—Because the modification of Blish and Sandstedt permits larger amounts of maltose to be estimated than do other methods, the reagents specified by them (E. S. R., 74, p. 589) were selected as most readily adapted for the measurement of Lintner values.

"It remained for the authors to work out the relationship of the reducing substances formed, estimated as maltose hydrate, to the alkaline ferricyanide consumed, and to fit the method to the analysis of malt and similar diastatic plant materials; since, as stated by Blish and Sandstedt, the table given by them is applicable only to solutions containing the special clarifying agents used in the measurement of diastasis in flour suspensions.

"The method applied to the analysis of malt described . . . depends on the reduction of potassium ferricyanide in slightly alkaline solution, followed by acidification and titration of the ferricyanide remaining by standard thiosulfate."

Constituents of pyrethrum flowers.—Determination of pyrethrin II, H. L. HALLER and F. ACREE, JR. (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 5, pp. 343, 344*).—"The method proposed in this paper [a contribution from the U. S. D. A. Bureau of Entomology and Plant Quarantine] is based upon the fact that pure pyrethrin II, being a methyl ester, yields, on refluxing with hydriodic acid, the quantity of methyl iodide required by its formula." The methyl iodide is absorbed in an acetic acid solution of potassium acetate to which bromine has been added. The following reaction then takes place: $CH_3I+Br_2 \rightarrow CH_3Br+IBr$; and $IBr+2Br_2+3H_2O \rightarrow HIO_3+5HBr$. The solution containing the iodic acid is treated with formic acid to remove the excess bromine, potassium iodide is added, the solution is acidified with dilute sulfuric acid, and the liberated iodine is titrated with a standard sodium thiosulfate solution.

The determination of spray coverage on apples, K. GROVES and J. MARSHALL (*Jour. Agr. Res. [U. S.], 51 (1935), No. 12, pp. 1139–1142, fig. 1*).—The authors of this contribution from the Washington Experiment Station consider

that the most satisfactory sampling method for coverage determinations "consists in cutting a number of disks from the fruit with a cork borer and analyzing them. The area of a disk removed from a sphere may be calculated by the formula,

$$\text{Area of disk} = 2\pi R(R - \sqrt{R^2 - r^2})$$

where R is the radius of the apple and r is the radius of the disk. It is not necessary to calculate this area for each different apple radius; a table of areas may be calculated for each ¼- or ½-cm radius interval and the areas of the disks taken from the nearest calculated radius. The disks are then digested and the arsenic determined by the bromate method. The digestion requires very little time. In the work at this station samples of 12 apples were selected from each experimental plat and 6 or more disks were cut from each apple for analysis. A sample of this size proved satisfactorily reproducible."

They further find that "the Gutzeit method, though useful for determining minute amounts of arsenic, such as occur in residue samples, is less suitable than the bromate method for ascertaining the relatively large amounts which are encountered in measuring deposits. In the latter case the 10-percent error expected in the Gutzeit method [found by Barnes and Murray (E. S. R., 66, p. 505) in a study of the accuracy of the Gutzeit procedure] compares [with the] less than 1 percent in the bromate method. Coverage determinations by the disk method correlated unusually well with control on arsenical sprayed plats."

AGRICULTURAL METEOROLOGY

Solar radiation and weather studies, C. G. Abbot (*Smithsn. Misc. Collect., 94 (1935), No. 10, pp. V+89, pls. 3, figs. 38; abs. in Nature [London], 136 (1935), No. 3450, p. 959*).—An account is given of investigations begun by S. P. Langley into the dependence of weather on variations in solar radiation, and continued and expanded by the author, involving especially the accuracy of measurements of these variations and the computation and interpretation of the results of observations at Montezuma, Chile; Table Mountain, Calif.; Mount St. Katherine, Egypt; and other high-altitude stations. A number of periodicities, ranging from 7 to 68 mo., were revealed by these studies, and the existence of a well-marked 23-yr. period was suggested. Relations between these and weather are traced by means of long meteorological records. Considerable success is claimed in this and in practical application of the results in long-period forecasts for 1934, 1935, and 1936, which, it is stated, were fairly well verified for temperature and precipitation in 1934.

The brightness of the sky, with special reference to the region within 3° of the sun, C. W. Allen (*Gerlands Beitr. Geophysik, 46 (1935), No. 1–2, pp. 32–43, figs. 4; Ger. abs., p. 32; abs. in Sci. Abs., Sect. A—Phys., 39 (1936), No. 458, pp. 128, 129*).—An apparatus designed to measure the intensity of atmospheric radiation within 3° of the sun and from other parts of the sky is described, with a review of the theory of sky brightness and computations of the theoretical intensity of radiation from a dustless sky for several zenith distances of the sun and sky, azimuths of the sky, and altitude above sea level. In general, it was found that the smallest sky intensities measured agreed fairly well with the dustless sky theory, but that measurements within 3° of the sun were at least three times as great as the values calculated for a pure atmosphere.

Climatological data for the United States by sections, [January–December 1935] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 22 (1935), Nos. 1–12,*

[*about 200 pp., 3 pls., 3 figs. each*]).—These numbers contain the usual brief summaries and detailed tabular statements of climatological data for each State.

A geographical study of New England temperatures, P. E. CHURCH (*Geogr. Rev., 26 (1936), No. 2, pp. 283–292, figs. 3*).—"Of all the elements of climate", says the author, "temperature plays the most significant role in New England. The precipitation is generally adequate for all crops raised within the temperature limits. Wind, sunshine, cloudiness, and humidity are minor in their effects. . . . Except for a narrow zone along the south coast which is included in the Middle Atlantic trucking region and a part of northern Maine and northern New Hampshire in the forest and hay region, all of New England lies in the hay and dairying region. . . . In the greater part of the warm thermal belt, i. e., the lowlands and the low, wide river valleys, agriculture takes on a more specialized and localized aspect. Dairying is still the chief industry, but in more and larger areas than on the uplands other types of agricultural production assume primary importance. Some owe their existence to favorable temperatures." Fairly large areas are suitable for fruit growing and for the production of sweet corn for canning. The cool summers make sweet corn ripen slowly and thus remain for many days in the "milk stage", which is best for canning. Tobacco grows well in the Connecticut Valley, and truck crops in the warm lowland belt.

The specialized commercial agriculture of the northern Santa Clara Valley, E. N. TORBERT (*Geogr. Rev., 26 (1936), No. 2, pp. 247–263, figs. 12*).—Considering climate among other factors affecting the specialized commercial agriculture of the Santa Clara Valley, the author says: "The Santa Clara Valley enjoys a modified Mediterranean type of climate, excellent for the production of many deciduous fruits. . . . The eastern foothills support an agriculture different from that of the valley floor. On the broken and rather broad belt of hills east and northeast of San Jose, where slopes are not excessively steep, there has developed a combination of prune and apricot production with the growing of early peas and corn. . . . In contrast with the eastern foothills, the slopes at the west margin of the valley are little used for agriculture with the exception of some dissected bodies of old alluvium just above the valley floor. . . . The western hills face the north and northeast and so receive comparatively little insolation, whereas the opposite slopes—those used for early-pea production—obtain a maximum amount of heat, facing, as they do, the south and southwest."

A calendar of seasonal operations on typical farms in the valley is given.

Lunar atmospheric tides over Canada, A. THOMSON (*Jour. Roy. Astron. Soc. Canada, 29 (1935), No. 10, pp. 375–380; abs. in Sci. Abs., Sect. A—Phys., 39 (1936), No. 459, p. 254*).—The author concludes from his study of the influence of the moon on atmospheric tides that two maxima and minima occur each day, the maxima when the moon is highest in the sky and the minima when it is on the horizon. There are also seasonal variations in time and amplitude, but since the fluctuations are only 1 percent of those accompanying weather changes the moon's influence on weather is considered negligible. It is stated that the moon also produces small changes in the earth's magnetic field.

Atmospheric circulation and precipitation in the Near East [trans. title], G. BAUER (*Gerlands Beitr. Geophysik, 45 (1935), No. 4, pp. 381–548, pls. 4, figs. 13; abs. in Sci. Abs., Sect. A—Phys., 39 (1936), No. 458, p. 128*).—Distribution of precipitation throughout the year in the Near East and adjoining countries and how it originates is described fully and illustrated by charts, with a voluminous bibliography.

Determining the beginning of spring [trans. title], J. ŠIMEK (*Sborn. Českoslov. Akad. Zeměděl. (Ann. Czechoslovak Acad. Agr.), 10 (1935), No. 1, pp. 103–105; abs. in Deut. Landw. Rundschau, 12 (1935), No. 12, pp. 799, 800*).—The beginning of spring in different parts of Czechoslovakia as indicated by time of blooming is given for a number of fruits and various other plants. In general, the observed dates agreed well with those given by E. Ihne with considerable variation, as, for example, in the apple, depending upon local conditions.

The article is in both Czechoslovak and German.

SOILS—FERTILIZERS

A brief review of the development of the mechanical analysis of soils [trans. title], V. NOVÁK (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 2, pp. 23–36*).—The author outlines the history of the mechanical analysis of soils from 1800 to the present time. Methods of which the origin and development are taken up include the decantation, the sinker, the volumetric, and the pipette methods, methods dependent upon the determination of the continuous sedimentation curve without separation of individual fractions, and the washing methods. The representation of the mechanical composition, both numerically and graphically, is also considered, as are the preparation of the samples and the applications of the mechanical analysis of soils.

Names of the principal contributors to the technic of mechanical soil analysis, with the dates of publication of their work, are given, but specific journal references are not cited.

The principles of the chemical characterization of the soil [trans. title], A. A. J. DE 'SIGMOND (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 2, pp. 49–60*).—The author discusses briefly various methods of soil analysis and the interpretation to be placed upon the results. The paper is accompanied by illustrative data.

Direct microscopic and bacteriological examination of the soil, G. ROSSI, S. RICCARDO, G. GESUÈ, M. STANGANELLI, and T. K. WANG (*Soil. Sci., 41 (1936), No. 1, pp. 53–66*).—The authors describe three methods for obtaining preparations of soil micro-organisms for microscopic study: (1) The slide after being thoroughly sterilized by flaming is pressed against a cut surface of the soil. "The material remaining attached to the slide is then fixed by heat in the usual way, stained by the Conn method [E S. R., 60, p. 20] with carbol erythrosin (1 percent erythrosin solution with 5 percent phenol) employing heat, and thoroughly washed and dried." This procedure is called "the impression method." (2) "For the crushing method a small lump of soil is crushed on the surface of a microscope slide. The crushing takes place without artificial means when the soil is sufficiently soft; otherwise, the selected fragment is placed on a glass or a porcelain slab and then sprinkled with as much distilled water as it is considered capable of absorbing; for this a few minutes will suffice." (3) "Pairs of slides may be buried at a greater or less depth and extracted after a given time; they are then stained in the same way as soil samples prepared by crushing. Experiments have shown that the soil bacteria pass over the slide both on the upper and on the lower face, and not only the schizomycetes but also the hyphomycetes, streptothrices, and protozoa. It is necessary to use pairs of slides because one of the two faces—the lower face in the case of the upper slide and the upper face of the lower slide—must be put out of action by the necessity for staining and observation. In other words, the lower face of the lower slide acts as the lower face of the upper slide. At the moment of burial the slides are passed through the flame 50

times in order to purify them of any substance which might have chemotactic action on the soil bacteria, unless it is preferred to smear them with substances of which it is desired to study the possible chemotactic capacity."

The authors note that only the third method—that of burying the slides in pairs in the soil to be investigated—is now in use.

In addition to these preparation methods, the authors describe a procedure permitting the examination of a preparation from both sides, the preparation being in this case made on a cover glass which is first placed in immersion-oil contact with the slide with the material on its upper surface and is examined as an uncovered preparation in immersion oil. The cover glass can then be turned over, again mounted in immersion oil, and examined with the oil immersion objective as a covered mount. They further describe a counting method for cluster forms.

Numerous observations are summarized. "The isolated bacteria and the bacterial clusters in the ground can be stained even 38 yr. after the securing of the specimen and after it is completely dried up. Humidity and temperature may, even in vitro, exercise specific influences on the cluster forms. It is probable that the soil bacterial clusters may be considered as 'cysts' functionally analogous to those of the protozoa."

The bearing of recent investigations in soil colloids on soil classification, R. BRADFIELD (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 2, pp. 134–143*).—Considering the chemical as against the morphological bases for a classification of soils, the author of this contribution from the Ohio Experiment Station feels that "soils should be classified primarily on the basis of profile characteristics discernible in the field. In many cases differences will occur which are of ecological and agricultural significance which will not be revealed by a field examination of the profile. In such cases the chemist may be called upon to supply supplementary information which may be used for still further differentiation of the soils. But this must not be allowed to disturb the fundamental morphological classification. It is just an added refinement. . . .

"The colloid chemist needs the help of the trained eye of the morphologist. The morphologist needs the information supplied by the refined technic of the colloid chemist."

The subdivisions of the world soil groups, with special reference to the podsolized soils [trans. title], H. STREMME (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 2, pp. 143–150*).—The author describes, as a genetic classification of practical value in the survey and mapping of the soils of middle, northern, and western Europe, a system outlined in part as follows:

Vegetation soil types (grass steppe soils, forest soils, and heath soils); wet soil types (mineral wet soils, organic wet soils, carbonate soils, mottled clay and marl soils, "erubas" soils [developed over *eruptive, basic* rocks and their tufas], and scorched soils ["Brennböden"] characterized by an intense drying out or "burning" of the vegetation); relief soil types (mountain-forest soils, forest soils in deeply dissected ["zertaltem"] regions, mountain-meadow soils, wet mountain soils, skeletonous soils and rocks, and colluvial soils); and artificial soils, of which various forms are noted.

Development and significance of the great soil groups of the United States, C. E. KELLOGG (*U. S. Dept. Agr., Misc. Pub. 229 (1936), pp. 40, pls. 11, figs. 6*).—The nature of soils and the environmental factors responsible for their genesis are briefly discussed. Illustrations of each of the great groups of soils are included, and their particular evolution is explained. "The practical implications of a knowledge of the great soil regions and their relationship to the biological complex and consequently to human institutions," are pointed out.

Important variations in soils due to the influence of local factors are described, examples of such local variations are shown, and their relationship to the general group, with reference to the genesis of the soils and the local adaptation of agriculture within the general region, is discussed.

"Any summary statement of a rapidly developing body of knowledge is destined to be somewhat immature and soon out of date. Yet, even at the risk of subsequent corrections, it seems advisable to summarize the general bases of the modern concept of soils, together with those basic facts regarding soil genesis, which are well established and upon which there is some general agreement."

Following an introduction which includes a very brief historical note on the development of soil science, the author takes up the nature of soil, the classification of soils, the factors of soil genesis, the processes of soil development, the significance of the zonal groups of soils, and the significance of local soil types.

A study of the uniformity of soil types and of the fundamental differences between the different soil series, F. L. Davis (*Alabama Sta. Bul. 244 (1936), pp. 153, pls. 7, figs. 35*).—Laboratory and greenhouse tests on 111 soils of 8 series were made with the purpose of ascertaining the degree of uniformity of the soil types and the main differences among soil series in Alabama. The laboratory work included mechanical analyses; determinations of colloidal clay content; separation and chemical analyses of the colloidal clay fraction; determinations of total base-exchange capacity and exchangeable hydrogen, calcium, and magnesium; total P_2O_5 content; the organic matter content of the surface soil; the H-ion concentration; the lime required to bring the reaction to pH 6.50; and the readily available PO_4 content of all surface soils and those subsoils on which greenhouse tests were made by the Truog method and by a modification of the method. The greenhouse tests included various combinations of fertilizer treatment and test crops, and are stated to have been "so designed that by comparing the yield in response to each of the different fertilizer treatments to the yield in response to the complete (N P K) fertilizer treatment on each of the soils, the crop response to each of the following fertilizer treatments could be determined: (1) Potash, (2) phosphate, (3) lime, (4) residual phosphate without lime, (5) residual phosphate with lime, (6) minerals (phosphate and potash), and (7) nitrate on the limed cultures."

Of the results it is stated, in part, that "the characteristics of the soil profile of each of the different soil series are sufficiently distinct and different as observed in the field to warrant the classification as it exists.

"The results of the mechanical analyses show that the subdivision of types, i. e., the classification into sandy loam, fine sandy loam, very fine sandy loam, etc., by field examination is often in error.

"As determined in the laboratory, the physical and chemical properties of the soils of a given soil type were generally quite variable. In fact, the only physical and chemical properties of soils in which a significant difference existed between various soil types were those that could be directly attributed to wide differences in the textural properties of the soil type or to some more apparent difference between soil series such as (1) a variation in kind of materials from which the soils were derived, (2) an observable difference in the degree of maturity of the soil profile, (3) distinct differences in the climatic conditions under which the soils are formed.

"Although crop adaptability and productiveness of soils are in general associated with soil type, within the limits of the series and types studied in this investigation the variation in the yields obtained in response to the various

fertilizer treatments on the soils of a given soil type was greater than that occurring between the soils of the different soil series."

A rating of California soils, W. W. WEIR and R. E. STORIE (*California Sta. Bul. 599 (1936), pp. 157, fig. 1, maps 4*).—This bulletin lists the rating, as given by the Storie index method (E. S. R., 70, p. 157), of each soil type found in each of 59 soil-survey areas in California. An outline map shows the location of these areas. The soil-survey area has been taken as a unit for this rating, and each area is treated independently. The areas are arranged alphabetically, and the soil types are listed in each area in the order in which they are described in the corresponding soil-survey report. Four maps, separately printed, show the groupings assigned.

Revised nomenclature of soil type names used in Ohio soil surveys, G. W. CONREY and E. M. BUERAGE (*Ohio Sta. Spec. Circ. 47 (1936), pp. 29, figs. 2*).—The correlation with the present nomenclature of the soil-type names used in the older surveys is given in this bulletin, together with a list of Ohio soil types in 1936. "This information should greatly increase the usefulness of the early surveys. It is well to bear in mind, however, that the surveys made prior to 1910 are all very general in nature, and, in using them, this fact must be given due consideration."

Studies on the surface behavior of bentonites and clays, H. F. WINTERKORN (*Soil Sci., 41 (1936), No. 1, pp. 25–32, fig. 1*).—The author of this contribution from the University of Missouri points out that "the physico-chemical behavior of the surface of a colloidal particle is a function of both the geometrical and electrical properties of this surface. From a geometrical viewpoint the surface may be of the convex, plane, or concave type. Electrically, it may represent a sparse to dense system of point charges of either the same or of opposite sign." Upon these postulates he bases a comparatively simple mathematical analysis of the electrostatic conditions governing the behavior of clay on bentonite particles. Equations for the ideal convex surface (sphere) as well as for the plane surface type are given, these being developed under the assumption of a uniform surface charge which, in the case of the plane type, is further assumed to be relatively dense.

Characteristics of some morphological Solonetz soils of Minnesota, C. O. ROSS (*Jour. Amer. Soc. Agron., 28 (1936), No. 2, pp. 92–105, fig. 1*).—In an investigation carried out at the Minnesota Experiment Station the author examined samples from six soil profiles having morphological characteristics of solodized Solonetz and located in the southern part of the Minnesota portion of the Red River Valley. The soils were fine textured varying from silt loams to clays. The A horizon was found to be essentially free of soluble salts but these were present in the B horizon, where their quantity increased downward to a maximum in the C horizon. The A_1 horizon was acid in reaction in all cases and the A_2 in all but one case, whereas the B and C horizons were alkaline.

It was further found that "the total exchangeable bases decreased sharply in the A_2 horizon and rose again very sharply in the B horizon where, on the average, they reach a maximum and where they exceeded somewhat the amounts found in the C horizon. The exceptional features of the profiles were the very low amount of exchangeable sodium and the very high amounts of exchangeable magnesium found in the complex of the B horizon. Ordinarily the calcium and magnesium accounted for 90 percent or more of the exchangeable bases, and of this the exchangeable magnesium comprised one-half to three-fourths. The average percentage of exchangeable sodium in the same horizon was approximately 3.0, and was lower than would be expected if the soils were classified as Solonetz. Those for exchangeable magnesium, on the other hand, were much higher than would be anticipated. This situation is contrary to the

general conception of the development of Solonetz soils under the influence of exchangeable sodium in the absorptive complex of the B horizon, but it is pointed out that the present condition does not preclude an earlier stage of development when sodium may have been a dominant ion in the complex."

Shot soils of western Washington, L. C. WHEETING (*Soil Sci., 41 (1936), No. 1, pp. 35–45, pl. 1*).—According to the results of the Washington Experiment Station investigation here recorded, "shot clays are formed under forest vegetation only and are best developed where there is restricted internal drainage in the profile. They appear to be a natural development in the normal profile of the region. The proportion of shot in the glacial soils increases with depth in most cases and then decreases again. In the residual soil group most of the shot are found in the upper layer and decrease in numbers with depth. The size varies from 0.05 to 19 mm in diameter in the soils examined.

"The shot are spheroidal in shape. Coarse gravel is often found in the center of the larger shot, but the smaller pellets appear to be aggregates of finer soil particles. The shot often contain more silt and less clay than the surrounding soil matrix, but no striking differences in the percentage of sand separates occur. This might indicate that at the time of cementation the soil was richer in the silt fraction, but, upon further weathering, much of the unconsolidated portion of the soil outside of the pellets has been broken down to the dimensions of clay. The shot are richer in the sesquioxides and in phosphorus than is the soil surrounding them. On the other hand the soil is richer in silica than are the shot. Phosphorus in particular is concentrated in the shot.

"A possible explanation for the formation of these pellets is suggested by the precipitation and dehydration of soluble iron and aluminum compounds around nuclei during the dry summer season. The low solubility of the sesquioxides and phosphates subsequent to dehydration produces a permanent cementing material. Because of the similarity in composition of B horizons in normal podzolic soils and of shot in western Washington soils, it is reasonable to consider the shot as parts of a diffused B horizon scattered throughout the weathered portion of the soil profile."

Soils of Great Britain, G. W. ROBINSON (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 2, pp. 11–23*).—The author deals with the British soils in general outline, taking up first, as the most important factors in soil formation, surface, geology, climate, natural vegetation, and the effects of human interference. He then proceeds to consider the classification of British soils, Podsols, Brown earths, soils from calcareous materials, soils of impeded leaching, coastal sands, and agricultural utilization.

"In the new agricultural order which seems inevitable, planned development must play a growing part. This cannot be accomplished efficiently without fuller knowledge of the constitution of our soils and of their distribution over the face of our land. The soil map which we envisage is both an inventory of our natural resources and a chart to guide our progress."

Some aspects of tropical soils, F. HARDY (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 2, pp. 150–163*).—The author deals briefly, first, with the soil formation from various types of parent rock under the conditions of the humid Tropics (defined as regions having a mean annual rainfall of 1.2 m or more and an approximate temperature range of from 15° to 30° C.), and, secondly, with "the chief ecological relationships of humid tropical soils supporting natural forest, orchard crops, or field crops." The discussion is largely based upon the author's 15 yr. of soil investigations in the British Caribbean.

"The most satisfactory permanent agricultural soils in the Caribbean region are undoubtedly immature, geologically recent, deep alluvial soils, derived

from rocks rich in primary minerals, such as basic igneous rocks or volcanic ash. Sedimentary rocks, containing abundant calcium carbonate and a high proportion of nutrient-rich minerals, are almost as valuable. Among these are the black marl soils formed under relatively low rainfall and the calcareous Miocene clays occurring in wet hilly districts in Trinidad, Jamaica, and British Honduras. The poorest soils are those derived from acidic igneous rocks that have been exposed to intense weathering and leaching over long periods of time in districts of very high rainfall. Such soils are loose, sandy, and barren; they are widespread in the hinterland of British Guiana and parts of Central America, where they support a characteristic forest vegetation.

Studies in tropical soils.—Increase of acidity with depth, H. C. DOYNE (*Jour. Agr. Sci. [England], 25 (1935), No. 2, pp. 192–197*).—Noting that increase of acidity with depth is a common feature of Nigerian soils, the author presents examples and possible explanations of three types of acidity increase with depth.

"In the first, the greater acidity is confined to the depths immediately below the surface and is possibly dependent on a permanently undisturbed vegetation. In the second, the acidity continues to increase to a certain depth below which there is a regular decrease. This is more evident on mature soils, and may be dependent on a short but intense rainfall followed by a prolonged drought. In immature soils, derived from igneous acidic rocks under alternate wet and dry seasons, the acidity increases steadily with depth into the decaying rock mass."

Soil fertility studies in the Netherlands Indies, O. DE VRIES (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 2, pp. 119–133, figs. 2*).—The author covers, in broad outline, the extensive and widely diversified soil fertility research in progress in the Dutch East Indies. The topics treated include area and staff, field experiments, sugar experiments, experiments on rice, other crops, irrigated fields, annual v. perennial experiments, pot cultures, soil mapping, and codification of methods of testing.

Soils and manures in New Zealand, L. J. WILD (*Auckland, New Zeal., and London: Whitcomb & Tombs, [1934], 3. ed., rev. and enl., pp. [8]+180, figs. 15*).—This is a condensed and nontechnical handbook, of which a previous edition has been noted (E. S. R., 42, p. 511), for the practical farmer. "No attempt has been made to lay down rules for the management of soils or for the use of manures. What has been attempted is to acquaint the reader with the more important truths and general principles regarding these things, in the hope that if these are assimilated the farmer, who is on the spot and knows the local conditions, will be able to determine for himself the proper procedure in his own individual case."

The chapter headings are: The abode of the plant; plant nutrients in the soil; soil fertility and the principles of manuring; the improvement of fertility; the soils of New Zealand—general description and the geography of New Zealand soils; how to find the manurial requirements of a soil; manure—(1) soil improvers, (2) fertilizers; miscellaneous fertilizers; the valuation of manures; and manurial requirements of various crops.

[Soil investigations of the Colorado Station] (*Colorado Sta. Rpt. 1935, pp. 8, 9, 33, 34*).—This report notes new work on the control of excessive soil nitrates (E. S. R., 71, p. 163), the soil plaque method of determining mineral deficiencies in soils, effect of calcium chloride and sodium nitrate on microorganisms, and an investigation of the decomposition of organic matter and the nature of the microbiological activities in slick spot soils.

[Soil investigations by the Nebraska Station] (*Nebraska Sta. Rpt. [1935], pp. 15, 16*).—This progress report gives data as to the restoration of organic

matter in Nebraska soils, nitrification in soils, and phosphorus studies on alkaline soils.

Soil science in the cultivation of moorlands [trans. title], F. Beūne (*S. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans, vol. 2, pp. 164–180, pls. 2*) — The author takes up first, under the general head of the pedological bases of moorland cultivation, the definition of the terms "peat" ("torf") and "moorland" ("moor"), the formation of moorlands, and physical, chemical, and biological properties of moorland soils; and second, under the head of conclusions concerning practical moorland cultivation, soil analyses and their significance, the control of the water content, tillage, and the fertilizer treatment of moorlands.

Static friction measurements in the study of soil moisture relationships, L. C. Wheeting (*Soil Sci., 41 (1936), No. 1, pp. 1–11, figs. 4*).—The author reports from the Washington Experiment Station upon an investigation in which a method of static friction measurements was adapted to the study of water films on the surface of clay particles. Six clays were studied over a wide range of moisture, and certain relationships between maximum and minimum points on the curves for static friction and the Atterberg constants were found. The results indicate that the interfacial forces at the soil-water phase boundary are extremely important in the development of many physical properties of soils.

It was concluded, in part, that "the soil moisture relationships appear to be as follows: In air-dry soil the soil moisture exists in capillaries in the crystal lattice or, at best, in disconnected surface patches with the water molecules oriented and immobile except when heated. At the wilting point a continuous interfacial film is formed by oriented water molecules, which cover the particle surfaces but are still held strongly by interfacial molecular forces. At the rolling limit or lower plastic limit the composite film with its oriented water molecules, which are possessed of considerable tenacity, reaches its maximum thickness. This is the point where some freedom of movement among the water molecules is just beginning and a plastic condition appears. At the upper plastic limit or at the flowing limit a reversal of phases occurs corresponding to a change from a liquid in a solid to a solid in a liquid system."

The pF of the water in soil, R. K. Schofield (*S. Internatl. Cong. Soil. Sci., Oxford, Eng., 1935, Trans., vol. 2, pp. 37–48, figs. 3*).—The author of this contribution from the Rothamsted Experimental Station finds that:

"A treatment of soil moisture relationships based on energy considerations has the advantage that the results obtained are true regardless of the mechanisms at work. Buckingham's assumption [E. S. R., 18, p. 820] that there is an equilibrium suction for each moisture content does not provide a satisfactory practical basis. The suction needed to withdraw water from a moist soil is, in general, greater than that against which water will enter the soil at the same moisture content."

In order to deal conveniently with the whole range of suction, use is made of the logarithm of the height in centimeters of the equivalent water (or other liquid) column. The symbol pF is used for this quantity. The determination of pF by direct suction, freezing point, vapor pressure, vertical columns, centrifuge, and absorbent materials is considered. It is shown that by carefully distinguishing wetting from drying conditions the results of investigations on plant wilting and field moisture capacity can be given a rational interpretation. It is suggested that in ordinary soils the difference between the behavior on wetting and drying is due more to microplastic resistance to swelling and shrinking than to surface-tension effects.

The relation of soil moisture to pear tree wilting in a heavy clay soil, R. A. Work and M. R. Lewis (*Jour. Amer. Soc. Agron., 28 (1936), No. 2, pp. 124–134, figs. 3*).—A contribution from the Oregon Experiment Station and the U. S. D. A. Bureau of Agricultural Engineering reports that a pear tree on Meyer clay adobe soil near Medford, Oreg., was observed to wilt and partially defoliate while the average moisture content of each foot depth of soil and of almost all individual soil samples was well above the permanent wilting percentage, and records an investigation of the soil distribution accompanying this condition of the tree.

"When the tree showed serious suffering from water shortage, intensive soil moisture sampling showed that no material portion of the root zone was within 3.2 percent of the permanent wilting percentage. Some days later the rate of extraction of soil moisture became markedly slower, while the average moisture content of each foot depth of soil ranged from 1.7 to 4.2 percent above the permanent wilting percentage. Still later, withdrawal of soil moisture at all depths, except for the first foot, ceased before the average content of any foot was depleted to the permanent wilting percentage. The movement of water through the soil by capillary action was too slow to maintain a uniform condition in large masses of soil. . . .

"The following hypothesis appears to be valid: The soil moisture content of the soil in contact with the feeding roots may be at or near the permanent wilting percentage, while at the same time the moisture content at some distance, perhaps only a few millimeters away, may be much higher, thus allowing the average content for an ordinary soil sample to be well above the wilting percentage at the time a tree shows serious distress for need of water."

Soil erosion and its control in the United States, W. C. Lowdermilk (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 2, pp. 181–194, fig. 1*).—Following a concise summary of the recent striking illustrations of the vital and urgent nature of the problem which has been created by agricultural practices leading to uncontrolled soil erosion, the author states as his purpose in this brief contribution from the U. S. D. A. Soil Conservation Service to outline briefly "the problem of soil erosion or man-induced erosion and its control in the United States. The subject falls naturally into three parts: (1) A review of the condition of the American Continent when the English colonists cleared their first cornfields, (2) the present condition of the land after three centuries of agricultural exploitation, and (3) measures that are being taken to meet the menace and challenge of soil erosion to the people of the United States. . . .

"In view of the serious menace of erosion wastage to national welfare and of the complex nature of the problem, it is gratifying to report that at last the opportunity has arrived for initiating a national program of soil conservation, involving erosion prevention and control. It is one of the most important steps in conservation of natural resources taken by the Government of the United States since the establishment of national forests and the Forest Service."

The base exchange phenomenon of the soil, D. J. Hissink (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 2, pp. 60–74*).—The author discusses some general considerations, the magnitude of the base-exchange capacity of the soil, the condition of saturation and relations among the exchangeable bases, the changes occurring in the exchangeable bases of the Dutch "Kwelder" soils after diking, exchangeable magnesium, the relation between soil fertility and the properties of the adsorbent soil complex, the unique position of the H ion in the soil, and the destruction of the adsorbent soil complex.

He points out the prevention of the decomposition and the ultimate destruction of the adsorbent complex as one of the most important problems of agri-

culture, naming the use of lime as the most valuable means to this end, a view which he justifies on the ground that adsorbed calcium greatly hinders the decomposing effect of water and gives the adsorbent complex its greatest stability.

The mobilization of plant nutrients in the soil [trans. title], C. BARTHEL (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 2, pp. 75–81*).—This brief and rather general discussion is concerned mainly with the part played by micro-organisms in making organic nitrogen and carbon available to the higher plants. The mobilization of such other elements as phosphorus, sulfur, and calcium is mentioned but is not discussed.

The determination of the nutrient content or fertilizer requirement of the soil, with current results of our large cooperative project [trans. title], E. A. MITSCHERLICH (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 2, pp. 95–112, figs. 12*).—Discussing the comparative advantages of the field experiment and the pot test, the author points out, among other considerations, that the field experiment gives information as to the fertilizer needs of the soil only when one can obtain an increase in yield by the use of the fertilizer in question, and that if no such increase is obtained the adequacy of the soil nutrient reserve for the needs of the following season still remains unknown. The pot test, by limiting the quantity of soil from which the plants can obtain nutrients, is considered to give a much sharper indication of the limitations of the total resources of the soil. The main disadvantage of the pot test, that it gives no indication of the nutrient content of the subsoil, is shared by all the laboratory methods.

With pot-test results as standards, and with the use of data from 73 German soils, 51 East Prussian soils, 2 Honolulu soils, and 1 Australian soil, the author presents a comparison of the accuracy of various biological laboratory methods, including that of Neubauer (E. S. R., 53, p. 319), and chemical methods, including that of Truog (E. S. R., 43, p. 622). None of these was found as satisfactory as the pot method. A considerable body of data is presented numerically and graphically.

The solubility of applied nutrients in muck soils and the composition and quality of certain muck crops as influenced by soil reaction changes and moisture conditions, W. S. LIGON (*Michigan Sta. Tech. Bul. 147 (1935), pp. 51, figs. 6*).—Field, greenhouse, and lysimeter studies are reported.

The addition of sulfur to certain fertilized muck soils resulted in an increase in soil acidity, a large increase in soluble calcium content, a slight increase in potassium solubility, a decrease in nitrification in many cases, and, when sulfur was added in sufficient quantity to produce a fairly acid reaction, a large increase in phosphate solubility. Phosphate solubility in muck soils was greatly influenced by soil reaction, being much higher under acid conditions, especially below a pH of 6.0–6.2. On the other hand, calcium solubility was entirely independent of soil reaction, being governed instead by the calcium supply and by the acid radical with which it was associated. Hydrochloric and nitric acid exerted, in the soil, effects similar to those of sulfur or sulfuric acid on soil reaction and on the solubility of calcium, potassium, and phosphate. Their effect on spinach growth was much different, however, germination being much slower and later growth more rapid. Addition of strongly acid muck to alkaline muck did not result in a large increase in calcium solubility, as happened when chemical treatment was used to produce acidity. Phosphate solubility, however, increased consistently with each addition of strongly acid muck.

The addition of lime in sufficient amounts to certain fertilized muck soils resulted in a decrease in soil acidity, a decrease in phosphate solubility, an

increase in soluble calcium content, and, when the muck was strongly acid, an increase in nitrification.

"The quantities of soluble nutrients in the soil at the 2–3-in. depth were influenced also by water relationships, such as precipitation and height of water table. Soil reaction appeared not to be appreciably affected by moisture supply. . . . There seems to be no one effect to which the benefits of sulfur or lime treatment on certain Michigan mucks can be attributed. The soil reaction changes resulting from these treatments are accompanied by many other changes in the soil. Restoration of proper soil equilibria is apparently the most logical explanation."

There was no apparent correlation between the soluble potassium, calcium, or phosphate content in the soil and the percentage of the nutrient in any of the crops analyzed. Sulfur and lime applications to the soil affected the growth, mineral composition, and sugar content of certain muck crops to various degrees, depending, at least in part, upon the individual soil, the water level, and the crop in question. In general, with onions, beets, and carrots, better quality was accompanied by higher sugar content, especially in onions; however, "the differences, as secured under the conditions of this experiment, were not of sufficient magnitude to warrant use of sugar content as a basis for measurement of differences in crop quality."

The relationship of the phosphate concentration of solution cultures to the type and size of root systems and the time of maturity of certain plants, A. L. SOMMER (*Jour. Agr. Res. [U. S.], 52 (1936), No. 2, pp. 133–148, figs. 7*).—Solution culture experiments with tomatoes, peas, corn, wheat, buckwheat, and cotton are reported from the Alabama Experiment Station, the phosphate concentrations in the nutrient medium having been maintained at from 0.1 to 12.8 p. p. m. The conclusions were, in part, that:

"Plants with the larger root systems made better growth at low PO_4 concentrations, and more phosphorus was found in their stems than in the stems of plants with root systems of comparatively small surface. . . . Increasing PO_4 concentrations resulted in decreases of the root: top ratios. . . . Plants in lower PO_4 concentrations matured the earliest. Size and type of root system probably play an important part in determining the minimum PO_4 concentrations at which the different kinds of plants make satisfactory growth. High concentrations of PO_4 in solution cultures do not stimulate root development. Plants growing in culture solutions of low PO_4 concentrations mature earlier than those grown in solutions of high PO_4 concentration."

Studies on the biology and taxonomy of soil algae, J. B. PETERSON (*Dansk Bot. Arkiv, 8 (1935), No. 9, pp. 180, figs. 7*).—After defining the term "soil algae" the author gives a historical account, begining with the discovery of the soil algal flora early in the twentieth century.

The author's investigations indicate that such a flora exists in Denmark, both in cultivated and uncultivated soils, and also in the virgin soils of eastern Greenland. The number of algae was generally much higher at the surface than in the deeper soil layers, but the species were the same. The soil algae grew vigorously in soil samples in the light but did not multiply appreciably in the dark. It is therefore believed that the subterranean algae are derived from the surface, but the data make it improbable that their descent is an active one. Seeping water and soil containing earthworms favored the downward movement of the algae. Submitted to drying in the soil (to 1.5 percent of moisture), a portion of the algal cells died, but a state supervened in which the numbers of living cells and of species remained constant for several years. Manured soils possessed a much richer algal flora than unmanured soils. It

appears probable that neither frost nor high temperatures will kill all the surface algae.

No nitrogen-fixing power has been found for members of the Chlorophyceae or Diatomaceae, but some of the Cyanophyceae appear capable of binding free nitrogen in the presence of light. For both the Chlorophyceae and Cyanophyceae there is evidence that they can stimulate the activity of nitrogen-fixing bacteria, but only in the presence of light. The surface algae are considered to be producers, the subterranean forms consumers. The significance of the surface forms in the carbon cycle is based on the fact that they produce organic substances through photosynthesis. In the nitrogen cycle their role appears to lie in their stimulation of nitrogen-fixing bacteria.

A list is given of the Danish and eastern Greenland algal flora of the soil, accompanied by systematic and biological notes on each species. A bibliography of 12 pages is included.

The symbiotic relationship between soil bacteria and higher plants, as exemplified by the Leguminosae, H. G. THORNTON (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 2, pp. 81–94, figs. 5*).—Reviewing briefly a considerable number of recent investigations into the relation between the nitrogen-fixing nodule bacteria and the host plant, the author of this contribution from the Rothamsted Experimental Station notes, in part, that this work "has tended to emphasize the important part played by the host plant's physiology in disturbing this balance in either direction. The evidence points to the importance of the carbohydrate: nitrogen ratio in the plant's tissues as being the determining factor. When this ratio is altered by an increase in nitrogen (whether by the uptake of mineral nitrogen or through active nitrogen fixation) a resistance to root-hair infection is induced. The uptake of sufficient nitrate may even result in a corky layer being formed which walls off the bacterial tissue in such nodules as are present. When the carbohydrate: nitrogen ratio is narrowed through a reduction in carbohydrates, parasitism by the bacteria is induced. Optimum conditions for symbiosis would seem to depend on a wide ratio of carbohydrate to nitrogen.

"In addition to the changes in the direction of host resistance or bacterial parasitism seemingly due to the concentration of nitrogen in the plant, there are other phenomena of host resistance that appear to be more specific and are at present unexplained. These include the immunity of a given legume to infection by nodule bacteria derived from the nodules of most other legume species, and the partial resistance to infection and nodule formation which a legume shows even toward its own strains of the nodule organism. There are also those experimental results that suggest an acquired immunity conferred by nodules containing one strain against a different strain normally capable of infecting the plant. . . .

"Finally, there is the important discovery of noneffective strains and of the fact that the efficiency of a given strain can be altered by passage through the host plant."

The assimilation of phosphorus by Aspergillus niger and Cunninghamella sp., F. B. SMITH, P. E. BROWN, and H. C. MILLAR (*Jour. Amer. Soc. Agron., 27 (1935), No. 12, pp. 988–1000, figs. 11*).—In these studies from the Iowa Experiment Station, it was found that the weight of *A. niger* mycelium in the Niklas medium to which soil had been added was roughly proportional to the concentration of phosphorus in the medium, between 0 and 60 p. p. m. of phosphorus. It is concluded that with carefully standardized technique the weight of mycelium under these conditions may be used to indicate roughly the amount of phosphorus available to *A. niger*. The relation of the latter to crop availability was not determined.

Sulfur requirements of Azotobacter chroococcum, J. E. GREAVES and A. ANDERSON (*Soil Sci., 41 (1936), No. 3, pp. 197–201*).—*A. chroococcum* was grown at the Utah Experiment Station in a basic nutrient medium (mineral nutrients plus mannitol) to which were added colloidal sulfur and various sulfur-carrying compounds in varying quantities.

"Because of the toxicity of the compound, *A. chroococcum* did not grow in the presence of mustard oil and sulfur iodide, even when 5 p. p. m. were added. No nitrogen was fixed in the presence of sodium sulfocarbolate and sulfonmethane, because of the unavailability of sulfur, and none was fixed in the presence of autoclaved mustard oil, sodium thiocyanate, and sodium sulfanilate, not because of toxicity but because of the combined nitrogen content of the compounds, which discouraged nitrogen fixation. Cysteine supplied combined nitrogen, yet it did not discourage nitrogen fixation.

"Sodium thiocarbonate, sodium ethyl sulfate, colloidal sulfur, sulfur chloride, sulfuryl chloride, sodium sulfide, sodium sulfite, and sodium sulfate all are valuable carriers of sulfur to *A. chroococcum*. Judged from the gains in nitrogen occurring in their presence, apparently *A. chroococcum* requires sulfur in the form of sulfates, and all compounds which are spontaneously oxidized to sulfates or compounds which are converted by bacterial activities into sulfates may meet the sulfur requirements of *A. chroococcum*."

The nitrification process and plant nutrition, R. E. STEPHENSON (*Soil Sci., 41 (1936), No. 3, pp. 187–196*).—This discussion, contributed from the Oregon Experiment Station and based upon data assembled from a number of sources, presents the theory that nitrification is of importance in plant nutrition not only by reason of the supply of available nitrogen thus produced but also because of the effect of the nitric acid in bringing into solution soil cations necessary to the plant and not readily made available by other natural agencies.

"With nitrification eliminated there are no adequate means for dissolving a sufficient quantity of the cations of the mineral soil and for getting sufficient of either nitrogen or the cations into the plant. The mycorrhizal arrangement, while helpful to certain plants, can hardly be considered adequate. The mineral nutrition of crop plants on very acid soils is not satisfactory. Building up the nitrifying power of poor sour soil through the addition of high nitrogen organic matter and the use of lime to neutralize acids is favorable to the nutrition of common plants. Observation indicates that as soils become poor and base deficient, the renewal of organic matter which may support nitrification becomes increasingly important. Legumes may succeed with little organic matter if there is sufficient basic material to maintain the soil near neutrality.

"Humid subsoils, usually somewhat acid, low in organic matter, and possessing little biological activity are characteristically raw, or refuse to give up mineral nutrients even to legumes which are presumably able to obtain sufficient nitrogen from the air. A bad physical condition is often assigned as the cause for the rawness. Perhaps it is not the only cause. Incorporation of organic matter and the stimulation of the nitrification process entirely change the subsoil character. Mineral nutrients are liberated and plant growth is supported.

The subsoil of arid areas, by contrast, are usually not raw to legumes. These subsoils are alkaline in reaction and carry a good supply of easily soluble minerals. Carbonic acid given off by the roots of the plant is capable of bringing into solution and carrying into the plant some of the minerals so easily accessible. . . .

"Whenever conditions are favorable for complete mineralization of the organic matter, which means abundance of nitrate in soils that are rich in organic matter, there is also an abundance of available mineral nutrients important to plant growth. Among essential soil processes, therefore, nitrification stands high in its importance to the nutrition and growth of higher plants."

Effect of nitrogenous fertilizers, rate of seeding, and climatic conditions in the culture of wheat [trans. title], J. GAROLA (*Compt. Rend. Acad. Agr. France, 22 (1936), No. 7, pp. 296–303*).—In most of the experiments reported profitable returns were obtained by moderate application of nitrogen and of from 100 to 150 kg of seed per hectare (89 to 133 lb. per acre). The nitrogenous fertilizers irregularly but appreciably increased the nitrogen content of the grain. The effect of fertilizers was modified considerably by the character of the seed. Excessive rainfall was particularly unfavorable in this respect.

Effect of nitrogenous fertilizers, organic matter, sulfur, and colloidal silica on the availability of phosphorus in calcareous soils, H. D. CHAPMAN (*Jour. Amer. Soc. Agron., 28 (1936), No. 2, pp. 135–145, figs. 3*).—In pot culture experiments carried out at the California Citrus Experiment Station with Sudan grass as the test plant, physiologically acid nitrogenous fertilizers increased phosphate availability, the magnitude of the effect being related to the carbonate-phosphate ratio of the soil and the nature of the materials used. Sulfur markedly increased phosphate availability in all of the soils studied. This element was particularly effective on a soil low in carbonate and high in phosphate. Colloidal silica slightly increased phosphate availability. Sodium silicate was without effect. Filter paper added without phosphate applications depressed the yields of Sudan grass, presumably as a result of the competition for phosphate between cellulose-decomposing organisms and the plants. When filter paper was supplemented by phosphate, the yields were greater than those obtained with the phosphate alone, "indicating that carbon dioxide or other decomposition products of the filter paper increased phosphate availability. On the other hand, no effects were obtained from ground barley straw other than those which might be ascribed to the phosphorus it supplied."

The effect of replaceable bases on the physical properties of soils with special reference to the effect of replaceable calcium and sodium on index of friability, D. H. WEBB, D. S. JENNINGS, and J. D. PETERSON (*Soil Sci., 41 (1936), No. 1, pp. 13–24, figs. 2*).—An investigation of the influence of replaceable bases on various physical properties of soils (with special reference to the influence of replaceable calcium and sodium on the index of friability), in the course of which modifications were introduced into Christensen's method (E. S. R., 63, p. 316) for determining the friability of soils, is reported from the Utah Experiment Station.

The determinations reported indicated that treating the soil with sodium lowers the index of friability, thus producing a soil inferior in physical condition to calcium-treated soils; that the difference between the index of friability of a sodium-treated and a calcium-treated soil is greater for the wet than for the dry soil; and that the index of friability of soils corresponds more closely to the chemical treatment than to the replaceable bases present after treatment.

"The theory advanced to explain this fact assumes that the physical properties of sodium soil are changed if the replaceable sodium is removed by high salt concentration, such as a normal solution of calcium chloride, whereas the physical properties are comparatively unchanged if the sodium is removed by dilute solutions, such as calcium bicarbonate formed from calcium carbonate in the soil."

A study of some trace elements in fertilizer materials, L. W. GADDUM and L. H. ROGERS (*Florida Sta. Bul. 290 (1936), pp. 15*).—Spectrographic analyses of 64 materials for 18 trace elements are reported. Considerable variability from lot to lot of a given material was noted, but barium, strontium, copper, manganese, chromium, and boron were detected in most of the materials. Bismuth, arsenic, antimony, cadmium, tin, and silver were detected in only a few samples. Titanium, nickel, cobalt, vanadium, lead, and zinc were occasionally detected.

The phosphatic materials, the hardwood ashes, and the insoluble organic nitrogen sources contained the greatest variety of the trace elements studied, and the potash sources and the inorganic nitrogen sources contained the least variety. The hardwood ashes and the phosphatic materials contained, in general, higher proportions of more of the trace elements than did the other classes of materials; the potash sources and the inorganic nitrogen materials contained, in general, smaller proportions of the trace elements than did the other groups of materials.

The effect of fertilizers and liming upon the electrodialyzable manganese of sassafras silt, G. M. GILLIGAN (*Soil Sci., 41 (1936), No. 3, pp. 203–208*).—In an investigation carried out at the Delaware Experiment Station, samples from a series of soil plats which had been subjected to a definite schedule of treatments during a period of 24 yr. were electrodialyzed in order to determine the effect of these treatments upon the amount of manganese removed by this method. Without exception, the limed soils yielded the greater quantities of manganese. On a percentage basis, 2 plats of the limed group and 3 plats (K, NK, and NPK respectively) of the unlimed group yielded the least.

"Analyses of mixed hay indicated that very small amounts of manganese were removed from the limed plats whereas appreciable amounts were removed from the unlimed, yet certain limed plats contained less total manganese than did the corresponding unlimed plats. The results indicate the possibility of greater leaching from the limed plats during the cold, wet months, which may be attributed to the enhancement of reducing conditions brought about by waterlogging of limed soils. Although the KCl unlimed plat had the lowest pH, there was no marked variation within each group resulting from the treatments. No consistent indications of any marked influence of fertilizers on the electrodialyzable manganese of the plat soils were observed."

"Undoubtedly some factor or factors other than reaction alone influence the availability of manganese, for it has been found [at the New Hampshire Experiment Station; unpublished data] that in some cases manganese is readily available at H-ion concentrations well above neutrality."

Occurrence of selenium in natural phosphates, superphosphates, and phosphoric acid, L. F. RADER, JR., and W. L. HILL (*Jour. Agr. Res. [U. S.], 51 (1935), No. 12, pp. 1071–1083*).—The authors of this contribution from the U. S. D. A. Bureau of Chemistry and Soils report upon the selenium contents of 96 samples of phosphate rock and 3 samples of apatite from various deposits of the world, 8 representative samples of commercial superphosphates manufactured from domestic rock, and 4 samples of crude phosphoric acid produced by the sulfuric-acid process. The data indicate (1) that organic matter and, to a less extent, inorganic sulfides are important carriers of selenium in phosphate rock, (2) that primary deposits are in general richer in this element than are secondary deposits, (3) that deposits belonging to the Permian and Cretaceous ages contain the most selenium, and (4) that the selenium content of phosphate deposits is about the same as that of other sedimentary deposits in the same region.

"The quantity of selenium in superphosphate ranges from <0.8 to 4.0 p. p. m., and in phosphoric acid is 0.5 p. p. m. or less. According to the available data, only a small fraction of the selenium occurring in the natural materials from which superphosphate and phosphoric acid are made finds its way into the finished product."

Methods for the determination of the potassium and phosphorus requirements of soils used for agricultural purposes, W. U. BEHRENS (*Die Methoden zur Bestimmung des Kali- und Phosphorsäurebedarfs landwirtschaftlich genutzter Böden. Berlin: Verlag Chem., 1935. pp. 196, figs. 3*).—Noting that the number of publications on this subject has become very large, the author states as his purpose in the present manual not to review the published work completely but to bring together and discuss critically the more important work.

The principal topics considered are: Fundamental principles, under which head are taken up a historical review and outline of the problem, the absorption of nutrients by the plant, and the mathematical statement and evaluation of the relation between the results of various methods; the individual methods for the determination of the potassium and phosphorus requirements of soils, including field experiment methods, other purely physiological methods, methods involving physiological mobilization and chemical determination of nutrients, purely chemical methods, and methods involving chemical mobilization and physiological determination of nutrients. Under the general head of the technic of sampling and analysis are considered the taking of soil samples, the determination of potassium, and the determination of phosphoric acid. A bibliography, author index, and subject index conclude the volume.

The fixation of potash by muck soils, G. H. ENFIELD and S. D. CONNER (*Jour. Amer. Soc. Agron., 28 (1936), No. 2, pp. 146–155*).—The authors report from the Indiana Experiment Station the results of an experiment in which "five mucks, widely different in reaction, composition, and previous treatment, were tested in pots for potash fixation by growing four crops [barley, tomatoes, spinach, and Sudan grass] with three different treatments, viz, without potash, with potash [as potassium chloride] mixed with the entire pot of soil, and with potash applied in a layer beneath the seed.

"More potash was recovered and larger yields were procured from pots of potash-deficient mucks treated with potash in a layer than from those with the potash mixed with all the soil. In the case of mucks well supplied with potash, larger yields and more potash were obtained from the pots treated with the potassium chloride mixed with all the soil than from those with potash applied in a layer. Fixation of 25 mg of applied potash per 33⅓ g of muck was studied by the Neubauer method before and after four greenhouse crops were removed without the addition of any potash fertilizers. Larger amounts of the applied potash were recovered by the Neubauer method from potash-deficient soils than from those well supplied. In the Neubauer studies, lime did not cause any appreciable fixation of potash. On the very acid and potash-deficient mucks, more potash was removed by the plants in the presence of additional lime than without the addition of lime. There was a close correlation between exchangeable potassium, Neubauer results, and the response of plants in pots to potash fertilization."

The effects of 12-year residues of lime and magnesia upon the outgo of subsequent additions of potash, W. H. MACINTIRE, W. M. SHAW, J. B. YOUNG, and B. ROBINSON (*Jour. Amer. Soc. Agron., 28 (1936), No. 3, pp. 202–215, figs. 6*).—After a 12-yr. study of the effect of 21 full-depth incorporations of calcic and magnesic materials and 3 forms of sulfur (ferrous sulfate, pyrite, and the free element) upon outgo of calcium, magnesium, potassium, and

sulfate, the residual systems were given annual surface additions of potassium sulfate at the rate of 200 lb. of potassium oxide per 2,000,000 lb. of soil during the succeeding 6 yr.

The calcium compounds, at all rates, effected a repression in outgo of potassium, the repressive effect becoming greater with increase in rates of liming. The light additions of magnesium oxide alone and with sulfur supplements had an effect comparable to that of calcium oxide. Initially, the 32-ton magnesium oxide additions exerted the same repressive effect that they had had upon the native supplies of potassium during the preceding 12-yr. period; but, beginning with the third year, the 32-ton treatments greatly accelerated and enhanced the potassium outgo.

"The concentrations of calcium+magnesium in the leachings from the light additions of burnt lime, limestone, dolomite, and magnesium oxide during the first 12-yr. and the subsequent 6-yr. period were comparable, as explained by K-Ca+Mg exchange and greater increment from rain water during the latter period. The units that received the initial incorporations of ferrous sulfate, pyrite, and sulfur showed a decided decrease in the concentration of calcium+magnesium in the leachings of the 6-yr. period. But the concentrations found for the 32-ton additions of magnesium oxide were still materially greater than those found for the 32-ton additions of calcium oxide. The reversal in the effect induced by the large residues of magnesium oxide after 14 yr. cannot be explained, therefore, by variant concentrations of calcium and magnesium."

It is noted that this anomalous effect of the magnesia was observed only after "excessive additions of magnesium oxide, and that even after a period of 18 yr. the residues from all economic additions of calcium and magnesium exert a repressive effect upon the outgo of potassium from a built-up supply of that element."

Lime: Its need and use in West Virginia, W. H. Pierre and G. G. Pohlman (*West Virginia Sta. Circ. 71 (1936), pp. 24, figs. 7*).—This bulletin discusses the need for an increased use of lime in West Virginia, the local resources of the State, the relative value of limes as affected by the fineness of grinding, the testing of soils for lime requirement, differences in crop requirements, and other factors to which consideration must be given in the efficient use of liming materials.

"Greater attention to soil liming in West Virginia is necessary if farming is to be carried on efficiently and if the fertility of the soil is to be restored or maintained. . . . A partial reason for this situation is that the soils have gradually become more acid. For many years only a small part of the lime lost by leaching and by crop removal has been returned to the soil. Moreover, while the soils are becoming more and more acid the new problems and adjustments now facing agriculture emphasize more than ever the necessity of liming. In fact, it is doubtful whether very much permanent improvement on many West Virginia farms is possible until liming becomes a more general practice."

Inspection of agricultural lime products, H. D. Haskins (*Massachusetts Sta. Control Ser. Bul. 82 (1935), pp. 8*).—This is the twenty-fourth report on the inspection of agricultural lime products in Massachusetts. It gives the composition of the various products which have been sold in the State during the year. In case of the ground limestone products the mechanical analysis is also given.

Inspection of commercial fertilizers, H. D. Haskins (*Massachusetts Sta. Control Ser. Bul. 81 (1935), pp. 48*).—This bulletin contains the inspection analysis data for the 1935 fertilizer sales, together with related data.

The 1935 fertilizer sales exceeded those of the previous year by 5,564 tons of fertilizer and by 1,435 tons of plant food. Also, "of the total tonnage of mixed fertilizer sold in Massachusetts, 67 percent was from grades recommended by New England agronomists to meet New England conditions, and 17 percent additional tonnage was from grades varying but 1 percent in one or more plant food elements from the grades thus recommended."

Inspection of commercial fertilizers for 1935, T. O. SMITH and H. A. DAVIS (*New Hampshire Sta. Bul. 288 (1935), pp. 14*).—The report of the 1935 analyses of fertilizers showed the 83 brands of complete fertilizer examined to have an average guaranteed plant food content of 21.40 percent and an average actual analysis of 21.81 percent. The bulletin contains also a table of the tonnages of the various fertilizer grades used in New Hampshire in 1934. Nearly one-half the total tonnage was of the grades 5–8–7 and 4–8–10 N–P–K.

Inspection of fertilizers, W. L. ADAMS and A. S. KNOWLES, JR. (*Rhode Island Sta. Ann. Fert. Circ., 1935, pp. 18*).—In connection with the usual annual report of fertilizer analyses it is noted that magnesic limestone has recently to some extent replaced inert fillers, the limestone being "intended to counteract the acid-forming qualities of mixtures containing large quantities of ammonium salts", and that the magnesium content will be of use in many acid soils, as they are likely to be deficient in this element. It is announced that "mixtures sampled in 1936 will be examined and described as acid-forming or nonacid-forming in the next circular. Mixtures with an apparent acid-forming power equivalent to less than 50 lb. of calcium carbonate per ton of fertilizer will be classed as nonacid-forming."

AGRICULTURAL BOTANY

The story of the plant kingdom, M. C. COULTER (*Chicago: Univ. Chicago Press, 1935, pp. IX+270, figs. 119*).—This textbook is intended as the basis of "indispensable readings" for an introductory college course in botany. Of the 20 chapters, 12 attempt "to describe, and occasionally to explain, certain essentials of botanical science in a style which minimizes technical terminology and detail. . . . As a major framework of organization the author has employed the phylogenetic sequence." The rather copious footnotes, "though not essential parts of the sketch, provide qualifications, amplifications, and speculations that are felt to be wholesome mental fodder for the student."

Kansas plant hunters, A. L. CLAPP (*Kans. State Bd. Agr. Bien. Rpt., 29 (1933–34), pp. 175–190, figs. 15*).—This contribution from the Kansas Experiment Station reviews the lives and works of the following Kansas (by birth or adoption) plant explorers: D. G. Fairchild, M. A. Carleton, W. T. Swingle, C. F. Swingle, W. Popenoe, C. R. Enlow, H. V. Harlan, and S. C. Mason. Portraits are given of the first five, and also of E. W. Brandes and H. L. Westover.

Nomenclature at the Sixth International Botanical Congress, Amsterdam, September 2–7, 1935, M. L. GREEN (*Gard. Chron., 3. ser., 98 (1935), No. 2555, pp. 425–427*).—This gives a brief history of the discussions and actions on botanical nomenclature at various international congresses and the main actions and changes in rules adopted at the 1935 Congress.

A convenient sand-culture apparatus, R. W. WARD (*Jour. Arnold Arboretum, 17 (1936), No. 1, pp. 38–41, pl. 1, fig. 1*).—Each unit of the apparatus described consists primarily of an inverted, bottomless, 1-gal. jug (in which the experimental plants are grown in white silica sand) connected by Pyrex glass and rubber tubings to an inverted, standard, ½-gal. jug (the reservoir). The nutrient solution is flooded into the sand by elevating the second jug to the

proper height. As many of these units as are necessary can be assembled on a wooden stand (described and illustrated) and run simultaneously.

Two important studies in plant ecology published in unexpected places, R. M. HARPER (*Torreya, 35 (1935), No. 6, pp. 148–150*).—This note discusses briefly a paper by Bateman and Wells (E. S. R., 37, p. 432) on Copper in the Flora of a Copper-Tailing Region, and one by R. H. Cuyler on Vegetation as an Indicator of Geological Formations.[1]

Root systems of certain trees and shrubs grown on prairie soils, A. F. YEAGER (*Jour. Agr. Res. [U. S.], 51 (1935), No. 12, pp. 1085–1092, fig. 1*).—Observations by the North Dakota Experiment Station on the root development of 31 species of trees and shrubs growing on Fargo clay without irrigation showed that 97.3 percent of the roots were confined to the upper 4 ft. of soil. The maximum penetration observed was 10.25 ft. in the case of the Hibernal apple and the minimum 2.67 ft. in the butternut. Another series of observations at Buffalo, N. Dak., on Barnes loam showed practically the same penetration and spread as on the heavier Fargo soil. When extra water was available tree roots spread less widely and penetrated more deeply. Species of known drought resistance, such as the oak and chokecherry, which have comparatively deep root systems, differed from those without such drought resistance in that deep roots are characteristic regardless of existing moisture conditions.

The influence of climatic conditions on the resin content of leafy trees [trans. title], G. V. PIGULEVSKIĬ (*Zhur. Obshch. Khim., 5 (1935), No. 11, pp. 1634–1638*).—Species of *Pinus, Abies,* and *Picea* are discussed.

An analysis of the influence of season on photosynthesis in the Tropics, B. N. SINGH and K. KUMAR (*Indian Acad. Sci. Proc., 2 (1935), No. 5, Sect. B, pp. 437–456, figs. 2*).—From radishes sown at successive intervals of 15 days throughout the year, leaves of varying developmental stages were collected, and their assimilatory efficiency was estimated under both controlled and natural external factors and under varying combinations of factor intensity. The photosynthetic intensity, mainly of "young-mature" leaves under similar conditions, showed a decline as the season advanced from January to March (winter to spring), finally reaching a low value in June (summer). Toward October (fall) the intensity once more increased. During winter, increased light was more effective in accelerating photosynthesis than in summer. The increase in assimilation with that of CO_2 concentration was relatively also low in summer, but rises in temperature between 29° and 37° C. were effective in increasing it.

In January and February there was no immediate depressant effect of the time factor under normal conditions. An increase in light or in CO_2 alone did not accelerate the time effect, but acting together they did so. In June the time effect was not marked at those concentrations of factors which usually introduced the time effect during successive hours in the cooler months.

Summer leaves withstood higher temperatures than winter leaves, in which the time effect was pronounced at these high temperatures. Old leaves showed an early time effect even in summer. The temperature coefficient of actual assimilation at from 21° to 31° varied but little from season to season. At higher temperature ranges the winter values for this coefficient were lowest and the summer ones highest, with an intermediate level for the rainy season.

With passage from winter to summer, the height of radish plants decreased, the weight of the roots diminished, the leaf area became less, and their color changed. As compared with winter, the vegetative and reproductive phases and the stomatal openings were considerably reduced in summer.

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[1] Bul. Amer. Assoc. Petrol. Geol., 15 (1931), No. 1, pp. 67, 68, figs. 12.

The water content was relatively constant except for a decline in summer. This may account in part for the marked decline in photosynthesis in summer. The chlorophyll content was highest during the rainy season, lowest during summer, and fairly high during winter. Assimilation in the different seasons thus appears to vary, in general, with the chlorophyll content. The summer decline in assimilation, in spite of the high temperature and light factors, is correlated with the march of the internal (chiefly respiratory rate, hydration, and chlorophyll content) and certain external (humidity and CO_2) factors. The dry matter and total leaf area were greater in winter than in summer, and the summer decline agreed fairly well with the lower photosynthetic activity during that time.

It is suggested that leaves adapt their structure and function to the intensity of the external factors, and that their specific adaptability is mainly induced by suitable changes in the internal factors here studied.

Photosynthesis in Grimmia montana, E. McKay (*Plant Physiol., 10 (1935), No. 4, pp. 803–809, fig. 1*).—In this study from the State College of Washington, determinations were made of the speed with which photosynthesis is begun in this xerophytic moss when water is made available. This was done by measuring the resistance changes in water surrounding the moss and by comparing lighted and darkened samples as a measure of the CO_2 change, and was checked by observations on sugar formation, using Fehling's solution. It is concluded that photosynthesis begins within from 6 to 10 min. after water becomes available and is great enough within 25 min. to utilize the CO_2 produced by respiration.

Action of heat, light, and radiations on plants [trans. title], P. Chouard (*Compt. Rend. Acad. Agr. France, 22 (1936), No. 4, pp. 133–140*).—This is a brief statement of the possibilities and the problems of artificial heating or lighting of plants which need further study, including especially the physiology of light effects, particularly ultraviolet light, and the development of efficient processes and systems of artificial lighting and heating in forcing of young plants and in obtaining flowers of a desired character at any given time.

[The reactions and processes initiated by light] (In *Cold Spring Harbor Symposia on Quantitative Biology, III. Cold Spring Harbor, N. Y.: Biol. Lab., 1935, vol. 3, pp. 71–209, 224–229, figs. 59*).—The following papers presented are of direct interest to botany: Protochlorophyll, by P. Rothemund (pp. 71–79); Behavior of Chlorophyll in Inheritance, by M. Demerec (pp. 80–86); Fluorescence and Photodecomposition of the Chlorophylls and Some of Their Derivatives in the Presence of Air, by V. M. Albers and H. V. Knorr (pp. 87–97); Fluorescence and Photodecomposition of the Chlorophylls and Some of Their Derivatives Under Atmospheres of O_2, CO_2, and N_2, by H. V. Knorr and V. M. Albers (pp. 98–107); Toward a More Quantitative Photochemical Study of the Plant Cell's Photosynthetic System, by F. P. Zscheile, Jr. (pp. 108–116); Light Intensity and Carbon Dioxide Concentration as Factors in Photosynthesis of Wheat, by F. S. Brackett (pp. 117–123); Kinetics of Photosynthesis in Chlorella, by W. Arnold (pp. 124–127); The Effect of Intense Light on the Assimilatory Mechanism of Green Plants, and Its Bearing on the Carbon Dioxide Factor, by R. Emerson (pp. 128–137); Photosynthesis of Bacteria, by C. B. van Niel (pp. 138–150); Chemistry of Photosynthesis, by N. R. Dhar (pp. 151–164); The Kinetic Mechanism of Photosynthesis, by D. Burk and H. Lineweaver (pp. 165–183); The Evolution of Oxygen in the Process of Photosynthesis, by O. L. Inman (pp. 184–190); The Absorption of Radiation by Leaves and Algae, by H. Mestre (pp. 191–209); and Photic Excitation and Phototropism in Single Plant Cells, by E. S. Castle (pp. 224–229).

Phototropism: A specific growth response to light, E. S. JOHNSTON (*Smithsn. Inst. Ann. Rpt., 1934, pp. 313–323, pls. 2, figs. 5*).—This is a brief general account of present knowledge on phototropism, together with a summary of studies of the subject at the Smithsonian Institution. It is concluded that the growth movement of plants known as phototropism is closely related to auxin and that it is directly related to the duration, intensity, and wave length of light.

The action of environmental conditions on ripening seeds of Phaseolus multiflorus [trans. title], E. BÜNNING (*Flora [Jena], n. ser., 29 (1935), No. 2, pp. 120–139, figs. 7*).—The author studied the effect of the date of maturing of seeds of *P. multiflorus* on the organs of the seeds and of the seedlings grown from seeds matured and harvested between late August and late October. The later the date of maturing, the shorter were the epicotyls in the seeds and in the seedlings grown from them and the quicker the first pair of leaves of the resulting seedlings reached maturity. However, the final size of the first pair of leaves on the seedlings was the same regardless of the time of seed maturity. The average weight of the seeds, size of cotyledons, and other characteristics of the various organs were not modified by their date of maturity. The average mean temperature during the 5 weeks just preceding seed maturity determined the length of the epicotyl and the rate of development of the first pair of leaves. The higher the temperature during this period, the longer the epicotyl and the slower the development of the first pair of leaves in the resulting seedlings.—(*Courtesy Biol. Abs.*)

A method of measuring respiration and carbon fixation of plants under controlled environmental conditions, J. W. MITCHELL (*Bot. Gaz., 97 (1935), No. 2, pp. 376–387, figs. 5*).—"An apparatus is described with which the hourly rates of carbon fixation or respiration of attached leaves can be accurately determined. Descriptions of a new type of circulatory pump and two new types of leaf chamber are given. Artificially controlled environmental conditions are described in which several species of plants have gained in dry weight over a period up to 4 weeks. Of the sources tested, an Eveready carbon arc lamp, enclosed by a housing of window glass, was found to be the most suitable for maintaining plants under conditions of artificial light."

Studies of the effect of artificial wind on growth and transpiration in Helianthus annuus, E. V. MARTIN and F. E. CLEMENTS (*Plant Physiol., 10 (1935), No. 4, pp. 613–636, figs. 10*).—Three large automobile fans were used in order that several wind velocities could be obtained simultaneously. With velocities up to about 2 miles per hour, the transpiration rate increased at the onset of wind about 20 to 30 percent and maintained this value as long as the wind acted. For velocities above this, however, there was usually a rather high initial rise for the first few minutes after the wind was turned on, followed by a fall, and again usually by a gradual increase. The initial increase in the rate of water loss rose with increasing velocity, reaching 138 percent in the case of the 16 miles per hour wind. This caused slight wilting of the leaves and closure of the stomata, with consequent reduction in the transpiration rate. The average increase in the rate of water loss over a period of from 2 to 4 hr. rose very rapidly with velocity up to about 2 to 3 miles per hour, but the curve flattened out in this range and mounted only slowly thereafter. Wind of 1 mile per hour caused an increase of approximately 30 percent, while one of 16 miles per hour induced only about 50 percent.

Plants grown under wind velocities of 5, 10, and 15 miles per hours showed effects increasing with the velocity. Leaf area, stem height and diameter, dry weight, and total transpiration decreased with increasing wind velocity, while the water requirement increased. The dry weight of material produced in from

6 to 8 weeks of growth was reduced by the 15 miles per hour wind to about one-half or one-third of that produced by the control plants. The effect of wind on the transpiration rate was relatively considerably greater at night than during the day, and plants grown under the higher wind velocities showed the gnarled and twisted appearance characterizing trees in windy habitats.—(*Courtesy Biol. Abs.*)

The stomata and transpiration of oaks, L. E. Yocum (*Plant Physiol., 10 (1935), No. 4, pp. 795–801, figs. 2*).—Measurements of transpiration from oak leaves with cobalt chloride paper during 24-hr. periods indicated the stomata to be functional. With adequate soil moisture, transpiration goes on continuously during the day but ceases at night. When the soil moisture is near the wilting coefficient they may remain closed all day, as shown by the absence of transpiration when tested with cobalt chloride paper and by the absence of starch when tested with iodine.

The stomata, counted on the trees and seedlings of a number of *Quercus* species, were small but very numerous. *Q. triloba* averaged 1,192 stomata per square millimeter, and the guard cells covered 50 percent or more of the surface. The number was uniform for all heights studied on trees, but on indefinitely growing shoots it increased with height. It is suggested that this may be due to the decreasing soil moisture causing a xeromorphic structure.—(*Courtesy Biol. Abs.*)

Streamline flow and the movement of solutes in the transpiration stream, R. C. McLean and L. R. Hutchings (*Plant Physiol., 10 (1935), No. 4, pp. 773–780*).—Small quantities of colored solutions introduced over the mercury in an Askenasy evaporation tube showed a remarkably rapid rise along the axis of the water column, often reaching a height of 10 in. in less than 15 min. This is attributed to the effect of streamline flow. The maximum axial velocity was, however, considerably greater than twice the mean velocity, as in normal streamline flow, and it is suggested that the transverse differences of velocity are greater in water under negative pressure. These observations are significant with regard to the movement of solutes in the transpiration stream. Under the conditions in the living plant streamline flow must exist in the vessels, and even with very low rates of water loss there is the possibility of comparatively rapid upward translocation—(*Courtesy Biol. Abs.*)

The water vapor loss from freshly unfoldel leaves [trans. title], T. Schmucker (*Ber. Deut. Bot. Gesell., 53 (1935), Gen. Versamml. Heft 1, pp. 27–38, fig. 1*).—Measuring transpiration by the rapid weighing of cut leaves or twigs, the water vapor loss from freshly unfolded leaves of deciduous trees of the temperate zone amounted, under average conditions, to about 1 to 2 mg per 100 cm^2 of surface per minute, and the transpiration was preponderantly cuticular. Within a few hours the water supply in the reservoir was used up. Mature leaves of the same tree gave off, with moderate stomatal opening, several times as much. Bud scales of the linden, shortly after leaf eruption, gave off as much water as the leaves, those of the oak up to 20 percent, and those of the beech only a small percentage. Thus, at the time of leaf eruption the water consumption is much less than at a later stage, although still considerable.

The very delicate leaves of *Brownea*, a tropical plant with pronounced shedding of leaves, gave off surprisingly little water, and the supply in the receptacle sufficed for more than a day. The water loss rose but little with the temperature or with increased dryness of the air, but mature leaves continually showed a high relative transpiration. It is therefore considered highly questionable whether, as has been assumed, foliage shedding is necessary as a defense against transpiration, but it is to be assumed that the limited perme-

ability of the upper leaf surface, with its low chlorophyll content, does bear such a relation. The leaves of *Theobroma* and *Coffea*, in many ways superficially similar, behaved quite differently, giving off very much water.

The water loss from young shoots of coniferous trees as compared with that from mature parts was considerable, but considered absolutely it was very little.

Unfreezable and freezable water equilibrium in plant tissues as influenced by sub-zero temperatures, G. A. GREATHOUSE (*Plant Physiol., 10 (1935), No. 4, pp. 781–788*).—In this study from the University of Maryland the calorimetric method used for the determination of unfreezable values is discussed.

The hypothesis that bicolloidal systems have a definite temperature (—18° to —20° C.) at which all the unfreezable water will be frozen was tested for plant tissues. It was not supported by measurements on unhardened, but seems to be valid for hardened clover root tissues. Potato tissues gave results similar to those of the unhardened clover root tissues, except that the unfreezable water values were lower for like subzero temperatures.

The physiological significance of ring v. scattered pores [trans. title], B. HUBER (*Ber. Deut. Bot. Gesell., 53 (1935), No. 8, pp. 711–719*).—This is a review from which the author concludes that the water conduction of ring-pored woods, though taking place almost exclusively in the outermost ring, is nevertheless about 10 times that in woods with scattered pores. The highest rate, 43.6 m per hour, was recorded for the oak.

The origin and biological significance of the ring and diffuse pored conditions are discussed.

The mechanism of cell stretching on the basis of the micellar theory [trans. title], J. BONNER (*Jahrb. Wiss. Bot., 82 (1935), No. 3, pp. 377–412, figs. 15*).—According to the author's conception of the micellar structure of the young parenchymatous cell wall, the cellulose framework must be responsible for the mechanical and optical properties of the wall and the young cell wall must be thought of as "living."

In artificial stretching the micellar framework of the cell walls (parenchymatous and epidermal) behaves like that of artificial cellulose products, such as Cellophane and synthetic silk. Since the orientating effect of the cell wall micelles is partly or completely absent in growth, the latter must be considered as a simple, plastic stretching. The increase in plasticity in the oat coleoptile in the presence of growth hormones may be traced back to a loosening of the adherence points of the cellulose micelles. Growth is then to be conceived as the simultaneous action of turgor stretching and of the intercalation of cellulose micelles.

Macrosporogenesis and development of the embryo sac of Lilium henryi, D. C. COOPER (*Bot. Gaz., 97 (1935), No. 2, pp. 346–355, pls. 2, figs. 9*).—This is a contribution from the Wisconsin Experiment Station.

Modification of leaf structure by X-rays, Y. NOGUCHI (*Plant Physiol., 10 (1935), No. 4, pp. 753–762, figs. 6*).—Malformations and irregular coloring of the leaf blades are frequently induced by X-ray irradiation of the seeds of sunflowers (*Helianthus annuus*). Usually the light, dark-green, or colorless areas intermingle with ordinary green, and even symptoms resembling mosaic disease appear when the injury is severe. The disturbance of cell arrangement in the tissues and the lack, or coagulation, of the chloroplasts accompanying the defects in chlorophyll absorbing power are the main causes of the abnormalities. The X-ray injuries seem to be localized, being confined to the directly treated region.—(*Courtesy Biol. Abs.*)

Further studies of elongation and expansion in Helianthus phytometers, F. E. CLEMENTS and F. L. LONG (*Plant Physiol., 10 (1935), No. 4, pp. 637–660,*

figs. 9).—The earlier conclusion that water content, as well as shade, plays a primary role in the elongation of stems and the expansion of leaves is confirmed by additional studies that included both free and standard phytometers of sunflower (*H. annuus*). The several plant organs behaved essentially like the entire plant in response to the 24 combinations of water and light. In addition to the close correlation between function and growth on one hand and these factors on the other, there was also a regular correspondence between the amounts of the latter and the structure of the leaf and stem as exhibited in stomata, mesophyll, and fibrovascular elements.—(*Courtesy Biol. Abs.*)

Some observations on iarovization [trans. title], S. VAN HOEK (*Landbouwk. Tijdschr.* [*Amsterdam*], *46* (*1934*), *No. 567, pp. 809–814*).—The author tested the effects of iarovization (methods of [T. D.] Lysenko) on summer wheat, soybeans, sorghum, and potatoes.

In the wheat trials one set was left at from 3° to 6° C. for 7 days and another set for 16 days. In both cases emergence and beginning of bloom occurred earlier in the iarovized seed than in the controls. The ear length and weight per 1,000 grains was also greatest for the plants from iarovized seed. Soybeans and sorghum showed no significant differences, but the plants from treated seed potatoes yielded somewhat more and had a greater proportion of large tubers than those from the untreated.—(*Courtesy Biol. Abs.*)

The growth hormone theory and its significance for the analysis of growth and growth movements in plants, P. BOYSEN JENSEN (*Die Wuchsstofftheorie und ihre Bedeutung fur die Analyse des Wachstums und der Wachstumsbewegungen der Pflanzen. Jena: Gustav Fischer, 1935, pp. VIII+166, figs. 26*).—This monographic review (with a literature list of 12 pages) treats the subject under the following main subdivisions: The discovery of the hormone of the oat coleoptile; the demonstration and quantitative determination, the preparation and properties, and the occurrence and formation of hormones; hormone transport; the significance of hormones for the normal growth of plants, for other vital processes, and for phototropic, geotropic, traumatropic, and haptotropic curvatures; and movements as irritation phenomena.

Growth hormone and cell division [trans. title], L. JOST (*Ber. Deut. Bot. Gesell., 53* (*1935*), *No. 8, pp. 733–750, fig. 1*).—This is a general review, including a discussion of the author's experiments made chiefly with *Phaseolus*, *Faba* [*Vicia*], and *Lupinus*, relative to the influence of various substances on cell division and enlargement.

The chemical nature of some growth hormones as determined by the diffusion method, A. N. J. HEYN (*K. Akad. Wetensch. Amsterdam, Proc, 38* (*1935*), *No. 10, pp. 1074–1081*).—By this method the hormone is allowed to diffuse through a set of agar slices placed upon one another, and after a certain time the concentration of the hormone in each agar slice is determined by its action on the plant. The method proved sufficiently accurate to distinguish between auxin and β-indolyl acetic acid, and it is believed that new hormones might very well be detected by its use. The diffusion coefficients were determined for β-indolyl acetic acid and for the growth hormones of coleoptiles and regenerated coleoptile tips of *Avena* and of the root tips of *Vicia faba*.

Experiments with follicular and other hormones and plant growth, M. A. H. TINCKER (*Ann. Appl. Biol., 22* (*1935*), *No. 4, pp. 619–629*).—Accelerated growth or acceleration of flowering was not obtained by presenting small amounts of ketohydroxyoestrin and theelol to flowering plants in different ways, but in one test auxin accelerated growth in a bacterial organism contaminating root cuttings treated with an auxin extract of yeast.

In an appendix S. E. Jacobs describes the organism just referred to as *Bacterium auxinophilum* n. sp. and reports confirmation of the auxin influence.

Hormones in relation to root formation on stem cuttings, W. C. COOPER (*Plant Physiol., 10 (1935), No. 4, pp. 789–794, figs. 4*).—One of the root-forming hormones, β-indolyl-acetic acid, was mixed with lanolin, 1 part hormone to 2,000 parts lanolin, and was applied to stem cuttings of *Acalypha*, fig, *Lantana*, lemon, and *Tradescantia*. These cuttings were then set in sand in a propagating frame. Treated with hormone, Eureka lemons after 4 weeks showed an average of 5.5 roots per cutting and the controls an average of 1.3. Similar increases in rooting induced by the hormone were also observed for cuttings of the other plants tested. Leafless lemon cuttings and *Tradescantia* internodes treated with the hormone produced a significant number of roots, while the controls showed none.—(*Courtesy Biol. Abs.*)

The rate of growth of Rhizobia, G. M. CAMERON and J. M. SHERMAN (*Jour. Bact., 30 (1935), No. 6, pp. 647–650*).—"Growth rates of 17 cultures of *Rhizobium leguminosarum*, *R. meliloti*, and *R. trifolii* were determined at 25° C. in a mannitol, yeast-extract, mineral salts broth. Under the conditions of these experiments, generation times of from 1.25 to 3.64 hr. were obtained during the periods of most rapid growth."

The dependence of indicators of condition on the salt nutrition as investigated in wheat plants [trans. title], W. H. FUCHS (*Planta, Arch. Wiss. Bot., 24 (1935), No. 4, pp. 725–741, figs. 4*).—The author investigated the osmotic value, conductivity, and sugar picture in the expressed sap of wheat seedlings grown in different salt solutions. Sodium ions were associated with a high osmotic value and low conductivity and sugar picture, potassium ions with a high osmotic value and conductivity and low sugar picture, and magnesium and calcium with low osmotic values and conductivity and high sugar picture. The influence of the anions Cl, SO_4, and NO_3 was also studied, and especially for the NO_3 anion.

The results as a whole are compared with the literature and discussed.

Microincineration studies.—II, Localization of ash-yielding substances during meiosis and its possible significance in X-irradiation phenomena, F. M. UBER and T. H. GOODSPEED (*Bot. Gaz., 97 (1935), No. 2, pp. 416–420, figs. 4*).—Continuing this series (E. S. R., 73, p. 758), incinerated sections of the anthers of *Lilium longiflorum grandiflorum* and of *Kniphofia* sp. on slides gave an ash picture showing the absence of ash in the karyolymph, an abundance of mineral residue in the chromosomes, and the presence of ash in the cytoplasm and in the cell wall. Save for the large amount of ash in the chromosomes, the spindle regions were devoid of nonvolatile mineral substances.

The bearing of the fact that elements of a comparatively high atomic number are concentrated in the chromosomes on the interpretation of quantitative lethal effects of X-radiation are discussed.

Evidence that some plant roots give off organic acids, J. C. RATSEK (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 620–622*).—At Cornell University the roots of *Oxalis repens* plants growing in Knudson's solution B modified by substituting nitrate of soda for calcium nitrate and adding no iron phosphate were found to secrete oxalic acid only when the calcium content of the nutrient solution was 100 or 250 p. p. m. When the calcium content was above 500 p. p. m. there appeared to be no secretion of oxalic acid. The best growth of the plants occurred in the calcium range where crystals of oxalate were found. In a similar experiment with corn in flasks, no calcium oxalate was found in any culture. In conclusion the author suggests that the results indicate that the roots of some plants may excrete organic acids, and that it is possible that a

relationship exists between the calcium content of the nutrient solution and the excretion of organic acids.

Leaf anatomy of some evergreen shrubs of Colorado, F. RAMALEY (*Jour. Colo.-Wyo. Acad. Sci., 2 (1935), No. 1, p. 42*).—This is an abstract of a paper presented at the eighth annual meeting of the academy.

Botany of groundnut, II, V. K. BADAMI (*Jour. Mysore Agr. and Expt. Union, 15 [1935], No. 2–3, pp. 59–70*).—This general account, including studies by the author, deals with the root hairs, leaf, flower, cytology, embryology, and ecological relations of *Arachis hypogaea*.

Some observations on the male gametophytes of the angiosperms [trans. title], W. W. FINN (*Ber. Deut. Bot. Gesell., 53 (1935), No. 8, pp. 679–686*).—This is a critical review of published data, including the work of the author's laboratory.

Proceedings of the local branches of the Society of American Bacteriologists: North Central Branch (*Jour. Bact., 30 (1935), No. 6, pp. 651, 652*).—Abstracts of the following papers from the University of Wisconsin are included: Growth Stimulants for Certain Rhizobia, by W. B. Sarles and J. J. Reid; Growth and Longevity of Rhizobia on Agar Containing Various Energy Sources, by J. J. Reid and W. B. Sarles; and Correlation of Pathogenicity and Viscosity in Cultures of *Phytomonas tumefaciens*, by T. O. Berge, A. J. Riker, and I. L. Baldwin.

The relation of oxidation-reduction potential to the growth of an aerobic microörganism, W. B. WOOD, JR., M. L. WOOD, and I. L. BALDWIN (*Jour. Bact., 30 (1935), No. 6, pp. 593–602, figs. 2*).—This study of *Bacillus megatherium* is a contribution from the Wisconsin Experiment Station.

The fresh-water algae of the United States, G. M. SMITH (*New York and London: McGraw-Hill Book Co., 1933, pp. XI+716, figs. 449*).—The aim of this comprehensive reference book, covering the known fresh-water algae of the United States, has been to enable the student to identify and to summarize the taxonomy, morphology, and life histories of these organisms. Footnotes in the text refer to the 44-page bibliography which is arranged alphabetically according to authors. A subject index is provided.

The effect of length of day and soil temperature upon nodulation of soybeans, C. B. CLEVENGER (*Jour. Elisha Mitchell Sci. Soc., 51 (1935), No. 2, pp. 212, 213*).—This is an abstract of a paper delivered at the thirty-fourth annual meeting of the North Carolina Academy of Science.

The cause of the root nodules of Alnus and of Elaeagnus and Hippophaë (Elaeagnaceae) [trans. title], M. ROBERG (*Jahrb. Wiss. Bot., 79 (1934), No. 3, pp. 472–492*).—Experimental plants (*A. glutinosa, E. angustifolia, E. argentea, E. multiflora, E. umbellata*, and *H. rhamnoides*) were grown in sterilized nutrient solutions and in such solutions on gravel, and cross inoculations were performed, using crushed root nodules as the inoculum. The *Alnus* nodules induced nodule formation only in *Alnus*, while those from *Elaeagnus* or *Hippophaë* gave positive results interchangeably in these two species, but not in *Alnus*. The author provisionally names the organisms *Actinomyces alni* n. sp. and *A. eleagni* n. sp., respectively.

When the nodules were present the three genera assimilated atmospheric nitrogen. In culture solutions with nitrate and suitable pH, the nitrogen nutrition of these plants was excellent in the absence of nodules. Various soils were tested as to the presence of these organisms. In culture solutions no diffusion of organic nitrogen out of the roots could be noted.

Some observations on nitrogen fixation by legume seeds [trans. title], B. J. HARITANTIS (*Ztschr. Pflanzenernähr., Düngung u. Bodenk., 34 (1934), No. 5–6, A, pp. 257–265, figs. 12*).—White lupines and peas were grown until the

cotyledons fell off under sterile conditions in flasks to which 20 cc of 1.5 percent strychnine nitrate or brucine had been added. Total nitrogen was determined at from 6- to 8-day intervals. A definite increase in the amount of nitrogen was found, which was greater in the flasks closed with cotton plugs than in tightly closed flasks, and slightly greater in light than in darkness. The increase is attributed to fixation by enzyme action.—(*Courtesy Biol. Abs.*)

Some effects of fuel oil on plants, G. D. FULLER and M. R. LEADBEATER (*Plant Physiol., 10 (1935), No. 4, pp. 817–820*).—Ordinary commercial fuel oil in amounts varying from 1 to 5 percent by volume applied to the soil of potted plants showed different detrimental effects on tomatoes and peaches. In the former the oil was absorbed and penetrated all parts of the plant, being found most abundantly in the xylem of the stems. Injury became apparent gradually, with death usually following in from 22 to 42 days, except with the 1 percent dosage. In peaches no absorption was apparent, and little or no injury was evident before death. The smaller amounts of oil caused but little injury.—(*Courtesy Biol. Abs.*)

Gas in greenhouses wreaks havoc on plants and flowers, P. R. KRONE (*Florists' Rev., 77 (1936), No. 1997, pp. 13–15, figs. 4*).—This is a contribution from the Michigan Experiment Station.

GENETICS

Inheritance of some major color types in beets, W. KELLER (*Jour. Agr. Res. [U. S.], 52 (1936), No. 1, pp. 27–38*).—In studies made by the U. S. D. A. Bureau of Plant Industry in cooperation with the Utah Experiment Station, the inheritance of color in nine types of beets obtained from crosses between sugar beets and red beets is reported.

"One cross, between a red-hypocotyl white-root sugar beet (*Ry ry*) × Detroit Dark Red table variety (*RY RY*), yielded four types: *RY* (red beet), *Ry* (red-hypocotyl white root), *rY* (yellow beet), and *ry* (yellow-hypocotyl white root). There is conclusive evidence of a close linkage between *Rr* and *Yy*, with approximately 7.5 percent crossing over. A pale red beet of similar genetic constitution was observed, but its complete genetic make-up for color was not learned.

"A second cross between a striped red beet of unknown origin ($R^t Y^r R^t Y^r$) × a red-hypocotyl white-root sugar beet (*Ry ry*) yielded five types: $R^t Y^r$ (striped red beet), $R^t y$ (red top white root), rY^r (green top yellow root), RY^r (green top red root), and *ry* (yellow hypocotyl white root). The root color was noticeably less intense whenever Y^r replaced *Y* in the various genotypes. There is a close linkage, with approximately 7.5 percent crossing over, between R^t and Y^r and a similar linkage between *R* and Y^r.

"It is believed that the *R* factors (*R*, R^t, and *r*) constitute one multiple allelomorphic series and the *Y* factors (*Y*, Y^r, and *y*) another series."

Modification of a Mendelian ratio in maize by pollen treatments, J. H. KEMPTON (*Jour. Agr. Res. [U. S.], 52 (1936), No. 2, pp. 81–121*).—Pollen grains of corn (*Zea mays*) from plants heterozygous for the waxy character (*Wx wx*) were stored for various periods of time under several conditions, viz, sunlight, artificial light, heat, cold, dark oxygen, etc., in an attempt to discover the factor or factors causing a differential survival of the two sorts of pollen grains. The greatest change in the relative effectiveness of pollen grains bearing the waxy gene (*wx*) is found when the pollen is exposed to high temperature and light. No differences were found between pollen grains bearing the waxy gene (*wx*) and those bearing the horny gene (*Wx*) in size, weight, or specific gravity.

Interspecific hybridization in Gossypium and the meiotic behavior of F_1 plants, J. M. WEBBER (*Jour. Agr. Res.* [*U. S.*], *51 (1935), No. 12, pp. 1047–1070, pls. 3, figs. 12*).—The study reported dealt with F_1 hybrids between and within five morphologically distinct groups of *Gossypium*, including cultivated American cottons (n=26), wild American species (n=13), cultivated Asiatic species (n=13), a wild Australian species, *G. sturtii* (n=13), and *Thurberia thespesioides* (n=13), possibly congeneric with *Gossypium*. See also an earlier note (E. S. R., 72, p. 461). The technic of cross-pollination in *Gossypium* is discussed briefly.

Interspecific hybrids within the same group were observed to exhibit normal meiotic behavior. Hybrids between species having 26 pairs of chromosomes, like their parents, occasionally form quadrivalent chromosomes. Although hybrids between cultivated American and wild American species generally form 13 bivalent and 13 univalent chromosomes, they occasionally also form quadrivalent chromosomes, a behavior also characterizing a natural hybrid between an Asiatic and a cultivated American cotton. *G. barbadense* × *G. sturtii* usually exhibits no chromosome pairing, but occasionally as many as 4 bivalent chromosomes have been observed. Hybrids between wild American species and *G. sturtii* likewise exhibit variable pairing, while hybrids between *T. thespesioides* and *G. sturtii* exhibit no chromosome pairing.

The occurrence of limited chromosome pairing in hybrids between wild American species and *G. sturtii* and formation of quadrivalents in hybrids between cultivated American and wild American species, and in a natural hybrid between an Asiatic and a cultivated American cotton, seemed to support the hypothesis that the species having 13 pairs of chromosomes are modified tetraploids. If such is the case, lack of pairing in *T. thespesioides* × *G. sturtii* must indicate that the chromosomes within the haploid sets of these two species have so differentiated genetically that pairing within either haploid set is impossible.

"The formation of 13 bivalent chromosomes in hybrids between cultivated American and wild American species and in a natural hybrid between an Asiatic and a cultivated American cotton and the very limited pairing in *G. barbadense* × *G. sturtii* support the hypothesis that the species having 26 pairs are allotetraploids. Such an origin possibly involved species or close allies of some two of the following groups: Wild American species of *Gossypium*, *T. thespesioides*, and Asiatic species of *Gossypium*."

Widespread occurrence and origin of fatuoids in Fulghum oats, F. A. COFFMAN and J. W. TAYLOR (*Jour. Agr. Res.* [*U. S.*], *52 (1936), No. 2, pp. 123–131, fig. 1*).—Further report is made on a study by the authors (E. S. R., 68, p. 745) to show the distribution of the fatuoid in Fulghum oats (*Avena byzantina*) and the role played by natural crossing in the occurrence of fatuoids.

Fatuoids were present in Fulghum oats at 28 experiment stations in 17 States of the United States, were not more numerous in the fall-sown than in the spring-sown oat areas, and nowhere were numerous enough to be an economic factor as weeds. They constituted less than 1 percent of any population of Fulghum oats examined. They are detrimental chiefly because their presence may discredit otherwise promising oat strains or seed samples.

About 0.2 percent of fatuoids appeared spontaneously in lines of normal Fulghum self-pollinated for four generations. In all cases the mutation apparently occurred to the intermediate type, resulting, in the following generation, in the production of fatuoid and normal plants in a ratio of 1:3. The Fulghum fatuoid bred true when selfed. Theoretically, the mutation

occurred to the intermediate form once in 125 individuals; mutation to the homozygous form would be expected to occur once in 15,625 individuals.

When the fatuoid was open-pollinated, according to data obtained from 5 years' study, it was cross-fertilized on an average 11.6 percent and a maximum of nearly 47 percent of cross-fertilization occurred in a single season. Under similar conditions, normal Fulghum, recognized as being relatively subject to natural crossing, contained less than 0.5 percent of crosses in any season. The ordinary or A type fatuoid in Fulghum seemed to be less vigorous and more readily cross-fertilized than the normal plant. Covering the panicles with glassine paper bags to prevent cross-pollination reduced fertility in all cases, the percentage of decrease being least in Black Mesdag and greatest in the fatuoid.

Periderm and cortex color inheritance in the potato, F. A. KRANTZ and H. MATTSON (*Jour. Agr. Res.* [*U. S.*], *52* (*1936*), *No. 1, pp. 59–64*).—In this paper, reporting studies carried on by the Minnesota Experiment Station in cooperation with the U. S. D. A. Bureau of Plant Industry, the segregation of red and white periderm color in progenies of 11 selfed potato plants has been explained by assuming that the complementary action of factors *E*, *S*, and *F* produced red color in the periderm and that certain parents carried duplicate factors. The inheritance of red cortex color has been explained by assuming that the complementary action of factors *C*, *R*, and *D* produced red color in the cortex. In one family a factor for red periderm color was segregating independently of two factors for red cortex color. Blue color in periderm and cortex has been referred to two factors, *P* and *P'*, each capable of changing red periderm and red cortex to blue. The observations suggest that while certain factors affect color in only one tissue, other factors influence color in both periderm and cortex.

Chromosome differences in a wheat-rye amphidiploid, V. H. FLOREll (*Jour. Agr. Res.* [*U. S.*], *52* (*1936*), *No. 3. pp. 199–204, figs. 2*).—A constant wheat × rye hybrid, bred and selected at the Arlington Experiment Farm in 1925, was found to be an amphidiploid. Fifty-six chromosomes were found in the root tips and 28 pairs in the pollen mother cells. Wheat and rye chromosomes could not be distinguished in the somatic cells. In the pollen mother cells at first metaphase the rye bivalents were found to be larger than those of the wheat. In most cases they were less deeply stained, some were banded transversely, and all had a strong tendency to arrange themselves at the border or edge of the chromosome group. This amphidiploid resulted from a cross of wheat × rye × wheat × rye, which makes it probable that somatic gametes were involved in its origin both in the F_1 wheat × rye hybrid and in the F_1 wheat × rye × wheat backcross.

Genetical studies with lettuce, II, [trans. title], A. H. BREMER and J. GRANA (*Gartenbauwissenschaft, 9* (*1935*), *No. 4, pp. 231–245, figs. 6*).—The discovery in the spring of 1931 in the early-season variety Kaiser Treib of a long-day plant which formed only a rosette of leaves under short days furnished material for crossing with varieties of neutral-day length response. In the F_2 and F_3 under long days there was noted a 12:3:1 ratio for bolting-, rosette-forming, and head-forming types, respectively. Under short days there was observed a 3:1 ratio for rosette and heading types. Head formation is believed to depend upon a recessive factor *k*, which becomes effective when the rosette factor *K* and the factor for early bolting under long days *T* are absent or when the factor *T* is rendered inactive by short days. The wild lettuces *Lactuca scariola*, *L. saligna*, and *L. virosa* are described as day length neutral forms, such as the types of lettuce grown in the summer garden. The author believes

it probable that length of day-susceptible forms of lettuce arose as factor mutations.

A tomato relative from Peru, J. W. LESLEY (*Jour. Heredity, 26 (1935), No. 11, pp. 451–453, figs. 3*).—In crosses made at the California Citrus Experiment Station between the cultivated tomato and *Lycopersicum peruvianum*, fruits were obtained when the cultivated tomato was used as the ovule parent, but none were secured from the reciprocal cross. The fruits were normal in shape and color, but the seeds were extremely small and failed to germinate in soil. Attempts to induce parthenogenetic formation of haploids by using *L. peruvianum* as the pollen parent were fruitless. The possible use of *L. peruvianum* as a means of producing seedless tomato fruits is discussed.

Cytology and fruit breeding.—III, The preparations a fruit tree makes to get the right chromosomes into its seeds, B. R. NEBEL (*Farm Res. [New York State Sta], 2 (1936), No. 3, p. 6, fig. 1*).—In this, the third contribution (E. S. R., 74, p. 179), the author discusses the gene as the carrier of specific characters and illustrates his discussion with descriptions of the cytology of the nectarine-peach cross, with particular reference to the inheritance of fuzziness.

The supposed genetic relationships of a certain variety of lemon very resistant to Deuterophoma tracheiphila with lemon and with citron [trans. title], G. RUGGIERI (*Bol. R. Staz. Patol. Veg. [Roma], n. ser., 15 (1935), No. 3, pp. 496–499*).—This is a discussion of the probable origin of the Italian lemon type known under the name "Interdonato."

The genetical conception of the species, S. C. HARLAND (*Biol. Rev. Cambridge Phil. Soc., 11 (1936), No. 1, pp. 83–112*).—A description is given of the behavior of genes in interspecific crosses, with information on the mode of distribution of allels in the different species.

The blood group properties of the horse and their inheritance [trans. title], A. KAEMPFFER (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 32 (1935), No. 2, pp. 169–198, pl. 1*).—A study of the blood group properties of 1,000 horses showed that six different genetic factors were involved. Sixty percent of the cases were accounted for by two pairs of factors, but the additional four pairs were needed to explain the situation existing in regard to the other blood types.

Further studies of the inheritance of these factors in 400 horses suggested the possible multiple allelomorphic nature of two of the genes influencing antigen characteristics. Because of the lack of data on the sires, information on the heritability of four of the agglutinin factors was incomplete.

Suggestions of a relation of color to blood group genes are offered.

On the genetics of rosette pattern in guinea pigs, S. WRIGHT (*Genetica ['s Gravenhage], 17 (1935), No. 5–6, pp. 547–560*).—Further study of the inheritance of the rosette pattern in the guinea pig[2] gives additional support to the conclusion that this characteristic behaves in accordance with a two-factor hypothesis of which one major factor is dominant and the modifying factor is incompletely dominant.

The results of Pictet and Ferrero (E. S. R., 62, p. 725) are discussed at considerable length, and the higher grades of roughness are thought to be perhaps due to two additional pairs of factors.

Contribution to the inheritance of color in swine [trans. title], J. SCHMIDT and E. LAUPRECHT (*Züchtungskunde, 11 (1936), No. 1, pp. 1–21, figs. 21*).—Data are reported on the color characteristics and pattern of the progeny of crosses

[2] Studies of inheritance in guinea-pigs and rats, W. E. Castle and S. Wright. Washington, D. C.: Carnegie Inst. Wash., 1916, pp. IV+192, pls. 7, figs. 7.

between several breeds of swine. These results indicate that the white of Improved Landschwein and Middle Whites were due to the same genetic factor which was dominant to the black color of the Hampshire, Berkshire, and Hannover-brown swine. Although the white of the Improved Landschwein was dominant over wild color, the striping of wild swine was dominant over the unstriped condition.

[Genetic studies with poultry] ([*Connecticut*] *Storrs Sta. Bul. 207 (1935), pp. 25–27*).—Results are briefly noted on reduced hatchability in Creeper fowls due to a lethal factor and nongenetic agencies such as variability in shell weight and defective bone structure; retardation in the growth of limb buds of normal embryos in vitro, in cooperation with H. B. Fell of the Strangeways Research Laboratory, England; in cooperation with the U. S. D. A. Bureau of Animal Industry, peculiar skeletal malformations in chick embryos produced by a vitamin deficiency; physiological disturbances observed in the Frizzle fowl, in cooperation with S. D. Aberle of Yale University, which suggested a condition of hypothyroidism; failure of the Frizzle host to effect feather development in skin transplants, suggesting the secondary nature of the thyroid abnormalities; and the observance of normal growth in newly hatched chicks following the removal of the rump and oil gland.

Precipitation test for a hybrid between Japanese Long-tailed fowl and White Leghorn, K. SASAKI (*Ztsch. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 32 (1935), No. 1, pp. 95–108, figs. 14; Ger. abs., pp. 107, 108*).—To study serological distinctions between purebreds and cross-breds at the Kyushu Imperial University, Fukuoka, Japan, a Silver-gray Japanese Long-tailed hen was crossed with a White Leghorn cockerel. The F_1s were largely white, although the male birds showed black and red pigment and more or less of the barred pattern. These characteristics were reduced in the F_1 hens. In conformation, the hybrids were not as slender as the Japanese fowl and they had long tails.

The F_2 males resembled the F_1s, but there were two types of females, one with pigment and the other with white plumage. Back crosses with a Leghorn male produced birds resembling the White Leghorn, whereas back crosses to the Japanese Long-tailed male produced two classes in both sexes, one similar to the Long-tailed type and the other resembling the F_1s.

Through the precipitin reactions of the blood sera it was possible to differentiate the F_1s, F_2s, and back crosses to the Japanese Long-tailed type from the parental breeds, although it was impossible to distinguish between White Leghorns and the back crosses sired by the Leghorn cockerel.

Variations in rib number and asymmetry of thorax of domestic animals [trans. title], M. MOSKOFF (*Anat. Anz., 78 (1934), Ergänzh., pp. 130–135*).—Studies of the rib number in 1,314 buffalo, 1,425 cattle, 1,320 sheep, 1,672 swine, 217 dogs, and 157 horses showed that variations were rarer in the more primitive animals. Differences in the species studied are discussed.

The biological importance of the fat tail of the Toushi-Sheep, E. DIANDIERI, SH. ABOULADZE, G. SANIKIDZE, and M. DIANDIERI (*Ztsch. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 32 (1935), No. 1, pp. 133–144*).—A study was made of the comparative changes in weight, size of the tail, and blood composition of the two fat-tailed sheep during periods without water, without feed, and when feed was supplied. This study showed how the fat tail serves as a reserve organ to tide the sheep over periods of reduced feed and water supply.

Remarks by L. Adametz are also included.

Investigations on two-egg cattle twins with like morphological, physiological, and psychological characteristics [trans. title], D. SANDERS (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 32 (1935), No. 2, pp. 223–268, figs. 33*).—Comparative measurements or descriptions of 24 characteristics are

given for 61 pairs of twins. Similarities of the twins of each pair are taken as an indication of a method of differentiating monozygotic and dizygotic twins.

Reproduction in the ferret. A summary of results with ferrets as compared with mammals [trans. title], E. MURR (*Ztschr. Zucht., Reihe B, Tierzücht. u. Zuchtungsbiol., 32 (1935), No. 2, pp. 269–290, figs. 17*).—The details of the reproductive process, involving the heat period, ovulation, spermatogenesis, and mating, are described.

A study of the involution of the mammary gland of the goat, C. W. TURNER and E. P. REINEKE (*Missouri Sta. Res. Bul. 235 (1936), pp. 23, figs. 18*).—Small blocks of the mammary gland of goats were removed periodically for histological study of involution of the gland when milking is suspended, when stimulation from milking is continued, and during the period of declining lactation.

The results showed that the suspension of milking 30 days after parturition resulted in degeneration of the lobule-alveolar system of the mammary gland, and only a duct system remained after 75 days. Cessation of milking on one side of the udder, with regular milking of the opposite side, retarded involution in the side not milked in two goats 30 days after parturition, but the stimulation apparently had no effect in retarding involution of the gland on the opposite side in a goat that had been milked about 6 mo. As lactation advanced, involution of the mammary gland was practically complete although a few alveoli remained.

Investigation of a sheep intersex [trans. title], C. KRONACHER, FR. HOGREVE, and E. MURR (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 32 (1935), No. 2, pp. 153–167, figs. 16*).—The results are reported of an anatomical, histological, and physiological study of the sexual organs of a Merino sheep which showed abnormal secondary sex characters. Characteristics of both sexes were found in internal and external organs.

The comparative behavior of mammalian eggs in vivo and in vitro.—I, The activation of ovarian eggs, G. PINCUS and E. V. ENZMANN (*Jour. Expt. Med., 62 (1935), No. 5, pp. 665–675, pls. 2*).—From a study of the development of the ova of rabbits in vivo following copulation or following the administration of beef pituitaries, it was found that the ovum goes through nuclear maturation with the production of the first polar body by the eighth day after copulation. It was demonstrated, by removing ova from the graafian follicles, that the ovarian egg in the ripe follicle is activatable and fertilizable at any time. Similar nuclear changes occur in vitro and in vivo.

Thyroxin injections in rabbits indirectly caused the same effect as mating or pituitary injections except that ovulation did not occur, but atresia of the follicles was initiated.

Pituitary hormones and thyroxin had no effect on the development of ova in culture media which might normally be fertilized with or without these materials.

Activity of androstendione on the sexual organs of the male rat, E. TSCHOPP (*Nature [London], 136 (1935), No. 3433, pp. 258, 259*).—Studies of the influence of androsterone and related compounds, injected in daily doses of 50, 100, and 200γ for 20 days, on the development of the seminal vesicles and penis of castrated rats are described. A high activity for androstendione and androstandione was indicated. It is concluded that androstendione, or a similar unsaturated ketone, may be identical with the less stable hormone or hormones of the testis.

Investigation on the influence of the gonadotropic substance of pregnancy urine on sex development in hens [trans. title], J. KŘÍŽENECKÝ and L. F. KAMENÍČEK (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 32 (1935), No. 2, pp. 199–222, figs. 2*).—The influence of 0.5 cc and 1 cc daily doses of pregnancy urine on weight increase, comb growth, and testicular and ovarian development in 4-month-old Leghorn cockerels and pullets is reported. The smaller doses had no influence on weight increase but were stimulating to comb growth and development of the spurs and testicles. The larger doses of the hormone either showed no effect or interfered with development. Some stimulation in the development of wattles of pullets was noted from the smaller doses.

Injections of alcoholic extracts of 5 cc and 10 cc of pregnancy urine into hens prevented ovarian development and no eggs were laid by some.

The endocrine function of the ovary seemed to be stimulated by the pregnancy-urine injections.

A study of sterility in cattle [trans. title], N. LAGERLÖF, trans. by E. BASS and E. BASS, JR. (*Ztsch. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 32 (1935), No. 1, pp. 47–93, figs. 22*).—Following a discussion of various causes of sterility in cattle, a report is given on several kinds of sperm recovered from cows after service by fertile and sterile bulls. The abnormal types of spermatozoa showed immaturity, doubling of the heads, doubling and curling of the tails, various modifications in the size and shape of the heads, and protoplasmic droplets attached to the tails of the sperm.

FIELD CROPS

[Field crops work in Colorado] (*Colorado Sta. Rpt. 1935, pp. 8, 9, 11, 26*).—Brief reports of progress (E. S. R., 72, p. 757) are given from linkage studies with barley, corn, and grain sorghum hybridization, range improvement, and a variety test of potatoes.

[Field crops experiments by the Storrs Station] ([*Connecticut*] *Storrs Sta. Bul. 207 (1935), pp. 6–9*).—Continuing previous reports (E. S. R., 73, p. 312), brief notes are given on the effects of time and frequency of cutting alfalfa under different fertilizer treatments; the effect of amount and depth of application of limestone; the effects of fertilizer treatments on the soil, flora, and production of permanent pastures; the technic of pasture research; response of pasture species to plant nutrients; the adaptability of Ladino clover and other legumes for pastures; and fertilizer experiments with potatoes.

[Field crops research by the Georgia Coastal Plain Station, 1934] (*Georgia Coastal Plain Sta. Bul. 25 [1935], pp. 11–41, 65–67, 96–102. figs. 5*).—Experiments with field crops (E. S. R., 72, p. 757) reviewed for 1934 and for various periods of years included variety tests with cotton, corn, oats, wheat, rye, sorgo, peanuts, lespedeza, soybeans, cowpeas, crotalaria, pasture grasses, and miscellaneous summer forage crops; breeding work with corn, oats, and peanuts; fertilizer experiments with cotton, corn, oats, peanuts, sweetpotatoes, and tobacco; winter cover crops for cotton and corn; cultural (including planting) experiments with oats, wheat, peanuts, lespedeza, soybeans, vetch, crotalaria, sweetpotatoes, potatoes, and tobacco; and pasture studies. The fertilizer experiments with cotton dealt with formulas, rates of applications, carriers of nitrogen and potassium, sodium nitrate and potassium chloride for top dressing, and placement. Several lines of research were in cooperation with the Georgia Experiment Station and the U. S. Department of Agriculture.

[Field crops work in Nebraska] (*Nebraska Sta. Rpt. [1935], pp. 9, 11–15, 18, 33, 36, 37, 38*).—Agronomic research (E. S. R., 73, p. 601) reported on from

the station and substations included, in addition to work already noted, variety tests with wheat, corn, oats, barley, grain sorghums, and soybeans; breeding work with corn, wheat, and alfalfa; crop rotations; trials of manure for sugar beets; effect of drought on crops; potato storage; nutritional conditions influencing tuberization in the potato; management of permanent pastures and native meadows; and weed control. Certain lines of work were in cooperation with the U. S. Department of Agriculture.

A digest of pasture research literature in the continental United States and Canada, 1885 to 1935, A. J. PIETERS (*U. S. Dept. Agr., Bur. Plant Indus., 1936, pp. [3]+130*).—Offered as a guide to research workers formulating research projects with pasture crops and with methods of establishing, maintaining, and utilizing pastures, this digest embraces 704 titles and an index.

A progress report on the production of annual legumes in the Panhandle of Oklahoma, H. A. DANIEL ([*Oklahoma*] *Panhandle Sta., Panhandle Bul. 59 (1936), pp. 3–9*).—The grain and hay yields were secured every year, 1924–35, when possible, from 10 varieties of cowpeas, 18 of soybeans, and 3 of miscellaneous beans grown at Goodwell, Okla. Blue Goose, Whippoorwill, and Early Red cowpeas offered some possibilities for hay and Blackeye and Early Buff were fair producers of grain. Soybeans as a whole made very poor yields of hay and grain and are not recommended for the semiarid country. The highest yielding hay varieties were Laredo, Pinedell, and Old Dominion. Tepary beans were found to be the surest and most profitable legume hay crop for the Oklahoma Panhandle, surpassing cowpeas, mung beans, and soybeans in order.

Preliminary studies conducted on green shelled Tepary beans indicated that they are as valuable as cowpeas or lima beans for human food.

Iowa No. 444 is desirable oat for Upper Peninsula, D. L. CLANAHAN (*Michigan Sta. Quart. Bul., 18 (1936), No. 3, pp. 159–161*).—Oat variety tests in 1933, 1934, and 1935 indicate the advantages of Iowa No. 444 for this section.

The relative vigor and productivity of potato plants from basal and apical sets cut from tubers in different stages of sprouting, F. C. STEWART (*New York State Sta. Bul. 658 (1936), pp. 18*).—In further and more extensive experiments (E. S. R., 70, p. 470), 100 small tubers of Smooth Rural potato were cut before sprouting had begun, and a similar lot was cut a week later when sprouts at the bud end were ¼ to ½ in. long. The tubers of both lots were cut crosswise into a basal set and an apical set of equal weight, which were planted 2 ft. apart in the row in tuber units.

Under both methods of cutting the sets, plants from the apical sets emerged a little earlier, were a little larger up to time of blooming, matured a little earlier, and gave a larger total yield than plants from basal sets. When tubers were cut before sprouting, plants from apical sets outyielded plants from basal sets by only 9.8 bu. per acre, or 3.44 percent, a difference not statistically significant. Where the tubers were cut after sprouting, plants from apical sets outyielded plants from basal sets by 38.85 bu., or 14.23 percent, and the difference was significant. The change in time of cutting also affected quite markedly the number of tubers per plant and the percentage of overlarge tubers.

Soybean projects of the State agricultural experiment stations, 1935–36, compiled by H. M. STEECE (*U. S. Dept. Agr., Off. Expt. Stas., 1936, pp. [2]+15*).—This lists by experiment stations the titles, leadership, and station departments of 215 currently active research projects concerned with soybeans.

Results of spring-wheat varieties grown in cooperative plot and nursery experiments in the spring-wheat region in 1935, J. A. CLARK (*U. S. Dept.*

Agr., Bur. Plant Indus., 1936, pp. 38, figs. 2).—Yields and other agronomic data are reported from plat and nursery experiments conducted during 1935 in cooperation with 7 State experiment stations in the spring wheat region. Results of milling and baking tests also are included.

The effect of spring applications of soluble nitrogen fertilizers on the yields of wheat on heavy soils, R. L. Cook and C. E. Millar (*Michigan Sta. Quart. Bul., 18 (1936), No. 3, pp. 182–192*).—In numerous nitrogen top-dressing experiments on wheat, conducted 1931–35 in a period of abnormal moisture conditions in several counties in lower Michigan on Miami and Brookston soils, representative types of heavy soil, sodium nitrate and ammonium sulfate were applied in early spring on plats usually alternating with untreated plats.

No consistent increases in wheat yields resulted from such top dressings, and the response to the treatments was practically equal on the two soil types. On a few fields rather definite and profitable increases in yield were obtained, but the systems of management practices on those fields or their apparent condition did not show how a positive response to top-dressing treatments could be foretold. From 2 yr. results, 1934–35, the analysis of the fertilizer applied in the fall appeared to have no effect on the response of the wheat to spring applications of soluble nitrogen.

"These data bring out clearly the fallacy of reporting only averages of replicated treatments when the variation between replicates is large and the plat arrangement does not readily lend itself to a statistical analysis of the data."

Seed and milling wheat survey, 1935, C. A. Lamb and E. G. Bayfield (*Ohio Sta. Bimo. Bul. 179 (1936), pp. 41–49, figs. 3*).—Results of a survey as to the quality of seed sown by Ohio farmers and the condition of the wheat received by millers are tabulated and discussed.

Germination studies on aged and injured seeds, O. A. Stevens (*Jour. Agr. Res. [U. S.], 51 (1935), No. 12, pp. 1093–1106, pl. 1, figs. 3*).—Annual germination tests, made at the North Dakota Experiment Station upon various seeds stored in the laboratory up to 20 yr., showed that the viability of good alfalfa and sweetclover seed declined steadily from about 95 to about 60 percent in 20 yr., and red clover dropped to about 10 percent.

The hard seeds in alfalfa mostly became permeable during the first year, although from 1 to 4 percent were present after 20 yr. Hard seed became permeable more slowly in red clover, and very slowly in sweetclover. In alfalfa and sweetclover seed discolored by frost when maturing, the percentage of hard seeds did not decrease in 10 yr., but some of them, especially in sweetclover, could not grow. Field plantings of alfalfa samples containing high percentages of hard seeds produced one-fourth to one-half more plants than indicated by the blotter test, while alfalfa without hard seeds and sweetclover (both with and without hard seeds) produced about one-half as many plants as indicated by the blotter test. Seeds 20 yr. old and brown frosted seeds gave only slightly poorer results, while broken and immature seeds gave only about one-half the results of normal seeds. Soybeans retained an average viability of 30 percent at 9 yr. Broken seeds of flax germinated poorly, but even pieces of less than one-half of a seed produced an average of 3 percent of plants in the field.

Normal seed of timothy retained normal vitality for 5 or 6 yr., then declined to 60 percent in 10 yr. Deglumed kernels from the same samples declined steadily to 20 percent, but in some samples more nearly approached the normal. Deglumed oats germinated from 63 to 98 percent. Commercial samples of proso often suffered severely from degluming. Intermixtures of bristle grass (*Setaria* spp.) in alfalfa and sweetclover seed were often deglumed but germinated as

much as 90 percent in some samples. Deglumed quackgrass germinated as high as 30 percent. Sowthistle seeds retained their viability 5 yr.

Seed statistics (*U. S. Dept. Agr., Bur. Agr. Econ., 1936, pp. [63]*).—Statistics are given on acreages, yields, production, selling prices, imports, exports, weights, and planting rates of different field crops seeds, and certain data on vegetable and flower seeds. An index is included.

Commercial agricultural seeds, 1935, G. P. STEINBAUER (*Maine Sta. Off. Insp. 158 (1935), pp. 118–132*).—The purity, weed seed content, germination, and in the case of legumes hard seed percentage are tabulated for 94 samples of agricultural seed collected from dealers in Maine in 1935.

Seed inspection, F. A. MCLAUGHLIN (*Massachusetts Sta. Control Ser. Bul. 80 (1935), pp. 66*).—The purity, germination, and weed seed contents are tabulated for 254 official samples of field crop seed and 489 of vegetable seed collected in Massachusetts during the year ended October 1, 1935. Results of field tests for trueness to type and variety on 207 lots of beans, beets, carrots, cucumbers, lettuce, onions, parsnips, radish, spinach, squash, sweet corn, and turnips obtained from neighborhood stores are included.

HORTICULTURE

[Horticultural studies by the Colorado Station] (*Colorado Sta. Rpt. 1935, pp. 24–26*).—Results are briefly noted on the breeding of the Sweet Spanish onion, improvement of pyrethrum by plant selection, and variety testing of vegetables.

[Horticultural studies by the Georgia Coastal Plain Station] (*Georgia Coastal Plain Sta. Bul. 25 [1935], pp. 68–77, 79–96, 108–112*).—Information is presented on the results of variety, cultural, and fertilizer tests with tomatoes, watermelons, lima beans, snap beans, asparagus, and various other truck crops and also on variety tests with peaches, plums, pecans, pears, grapes, figs, jujubes, blueberries, and other fruits. In addition work at outlying field stations upon varieties and culture and fertilizer requirements of vegetables is cited briefly.

[Horticulture at the Nebraska Station] (*Nebraska Sta. Rpt. [1935], pp. 17, 18, 35*).—Brief reports are presented on the results of soil moisture studies in the orchard and vineyard, effects of different systems of mulching and cultivation on the growth of apple roots, effect of mulching on asparagus yields and quality, effect of culture on the structure of carrot roots, and miscellaneous investigations. There is also a brief report on the testing of several species of conifers at the North Platte Substation.

Plant propagation by seedage, cuttage, layerage, and separation, T. J. TALBERT (*Missouri Sta. Circ. 191 (1936), pp. 18, figs. 10*).—General information is presented, with particular reference to horticultural plants.

The value of peat in a potting soil mixture, L. E. LONGLEY (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 639–644*).—Experiments at the University of Minnesota to determine how far peat may be substituted for manure in the potting soil indicated that as good or better results may be secured with many species, such as *Coleus*, *Calendula*, and annual larkspur, when a considerable portion of the manure is replaced by peat. French marigolds, *Browallia*, and *Schizanthus*, on the other hand, thrived best with a full manure quota. A *Begonia* species did very well with all the manure replaced by peat. Composting peat with manure or chemicals for a year in advance gave no better results than did fresh mixing at the time of potting.

Tests for nutrients in conducting tissue as indicators of the nutritional status in horticultural crops, E. M. EMMERT (*Amer. Soc. Hort. Sci. Proc., 31*

(1934), pp. 604–609).—Observing that snap and lima beans growing on heavily manured soils at the Kentucky Experiment Station did not set pods at all well as compared with the same varieties on poorer soil, determinations were made of the soluble nitrogen-phosphate phosphorus ratios in the various plants. As a result the author states that in snap beans the ratio of nitrogen to phosphorus should be between 1 and 3 at maturity and in lima beans from 0.5 to 1. It is suggested that if the phosphate could be increased the large amount of soluble nitrogen might not result in excessive vegetativeness. Cabbage and corn did not appear to require such low nitrogen-phosphorus ratios. Tomatoes and lettuce showed good correlation between nutrient concentrations and yield. The soluble nitrogen test worked satisfactorily on peach petioles because interfering organic compounds were destroyed previous to the addition of phenoldisulfonic acid.

The quality of vegetable seeds on sale in New York in 1934 and 1935, M. T. Munn (*New York State Sta. Bul. 664 (1936), pp. 21, figs. 5*).—This bulletin deals with the results secured in laboratory and field tests with samples of seed purchased upon the open market during the years 1934 and 1935. Changes in the vegetable seed control law at the close of 1934 resulted in a marked improvement in 1935, which was reflected in an increase in volume of better seed stocks and the disappearance of many questionable stocks and practices. On the whole, there were found many excellent lots of seed but still too many of questionable quality.

Insecticides and fungicides, 1935, E. R. Tobey (*Maine Sta. Off. Insp. 158 (1935), pp. 133–170*).—The results are given of analyses of 50 samples of insecticidal and fungicidal materials collected by the State Department of Agriculture in 1935.

Effects of magnesium deficiency in the soil on the yield, appearance, and composition of vegetable crops, R. L. Carolus (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 610–614*).—Observations in 1933 at the Virginia Truck Experiment Station on the effect of magnesium applications on 18 vegetable species showed increased yields ranging from 1 to 92 percent. The content of magnesium was also increased in the plants. The characteristic manifestation of magnesium deficiency is said to be a yellowing between the veins, brittleness, and marginal raggedness. Analyses for magnesium, nitrogen, and calcium in beans, cucumbers, peppers, and turnips showed a more pronounced effect on the magnesium content of the plants than on their yield. In the fleshy roots and fruits calcium was apparently used in place of magnesium when there was a deficiency.

Of six forms of lime, hydrated magnesium and dolomitic were the only two to induce an increased magnesium content in the plant. The other four, lacking in magnesium, depressed magnesium content below that of the controls. Analysis of cabbage plants from a magnesium-deficient field showed much less magnesium oxide in the leaves of the affected plants. The calcium and nitrogen contents of magnesium-deficient leaves were but little influenced.

Lists best sorts of peas, tomatoes, sweet corn, W. T. Tapley (*Farm Res. [New York State Sta.], 2 (1936), No. 3, pp. 3, 5, 6*).—As a result of trials at the station the author discusses varieties and suggests those which are especially promising.

Pole beans (*Farm Res. [New York State Sta.], 2 (1936), No. 3, p. 14*).—Notes on several varieties are given.

Fertilizers for early cabbage, A. B. Fite (*New Mexico Sta. Bul. 235 (1936), pp. 21, figs. 4*).—Experiments with Copenhagen Market Cabbage, grown on two types of soil differing in natural fertility and treated with stable manure and commercial fertilizers applied as single elements and in various combinations,

indicated that under existing prices of fertilizers and cabbage the profits from cabbage may be increased materially by a more general use of nitrogenous chemicals used alone or supplementary to animal manures. In fact it was indicated that a limited amount of manure supplemented by ammonium sulfate may be more profitable than manure alone. On depleted soils superphosphate showed indications of being of value when used in connection with nitrogenous materials. The returns from potash were too small to justify the use of this element. Green manures supplemented by chemicals also showed promise.

Cabbage fertilization in southwest Virginia, M. M. PARKER (*Virginia Truck Sta. Bul. 88 (1935), pp. 1235–1246, figs. 3*).—Experiments carried on over a period of 6 yr. (1929–34) in Wythe County, located in an area of summer production of cabbage, indicated that a lack of available phosphorus is more often a limiting factor in production than is either the lack of nitrogen or potash. Cabbage in the region is generally grown in the rotation including corn, cabbage, wheat, and grass. When stable manure was applied, clover sod turned under, or a number of animals pastured on the soil, only small amounts of nitrogen were needed for midseason cabbage crops. Potash was apparently present in fairly liberal amounts in the soil, yet its inclusion in relatively large amounts in a complete mixture increased yields.

As a result of the experiments, the author recommends 1,000 lb. per acre of a 4–8–12 mixture for soils of average fertility, with 100 lb. of nitrate of soda or other quickly available nitrogen applied as a side dressing about the time the plants begin to head. The general results indicated that large amounts of commercial fertilizer may be profitably used on the cabbage crop in southwestern Virginia.

Plant protectors and other factors influencing earliness and production of cantaloupes, G. W. WARE (*Arkansas Sta. Bul. 324 (1936), pp. 48, figs. 13*).—Over a period of 4 yr., 1932 to 1935, various types of protectors were tested at the Fruit and Truck Branch Experiment Station for covering seedling and transplanted muskmelons of the Pollock 10–25 pure line planted at different dates from March 21 to May 1. All of the protectors stimulated germination and reduced the time or range of emergence. In all treatments the green weight of the plants increased more rapidly under protectors. A temporary check in growth usually followed the removal of the covers, but the plants soon readjusted themselves to their changed environment. The greatest gain in date of first bloom was 3 days in the case of the continuous paper greenhouse protector.

Under the conditions seedlings gave generally as high or higher yields than comparable transplants. However, the latter beneath the continuous paper greenhouse covers produced more early marketable, total marketable, and grand total of melons than any other treatment. All protectors gave higher minimum and maximum soil and air temperatures than those in the open. In some cases the temperature rose to an injurious point. Protectors excluded light in proportion to their translucency, but all plants rapidly assumed natural color after uncovering. Although the value of protection varies from year to year with the weather, prices of melons, etc., the results indicate that producers of cantaloups for home and commercial markets would be warranted in using the better types when a premium for earliness is assured.

Day length response in the Chinese cabbage (Brassica pekinensis) [trans. title], A. H. BREMER (*Gartenbauwissenschaft, 9 (1935), No. 4, pp. 325–330, figs. 5*).—Using two day lengths, natural and a short 11.5-hr. day, it was found that under the long day the plants bolted quickly to seed without form-

ing heads, whereas under the 11.5-hr. day plants grew slowly and formed marketable heads.

Alcohol-insoluble residue as an index of quality of sweet corn, R. R. JENKINS (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 587–592*).—Determinations at the New York State Experiment Station of the quality of samples of sweet corn collected at several stages of maturity from different varieties and processed under commercial specifications indicated that in the whole kernel style of canning an alcohol-insoluble residue of less than 20.5 percent indicates fancy grade and up to 23 percent the extra standard grade. During the entire harvest period the percentages of total solids and alcohol-insoluble residue increased in the same ratio in each variety whether raw or canned. The ratios differed slightly, however, between the various strains. Alcohol-insoluble residue content cannot, on the other hand, be used as an index of quality in cream style canned corn.

Quality in hops, J. D. HARLAN (*Farm Res. [New York State Sta.], 2 (1936), No. 3, p. 4*).—Stating that aside from proper handling the quality of hops is determined by the quantity of bitter resins and the quality of the lupulin, the author suggests that lupulin is apparently more or less a varietal characteristic, making important the proper selection of varieties supplemented with the very best culture and handling of the harvested material.

Onion fertilizer experiments, A. B. FITE (*New Mexico Sta. Bul. 233 (1935), pp. 22, figs. 6*).—Based on 5 years' studies with the Early Grano variety, the most effective fertilizer treatment was found to be 10 tons of stable manure, 400 lb. of ammonium sulfate, 220 lb. of superphosphate, and 200 lb. of sulfate of potash. With superphosphate applied alone the yields were reduced below those of the check, but when combined with ammonium sulfate or stable manure superphosphate showed profitable yield increases. Potash was not used singly, as this element is generally present in abundance in the soil used, but additions to both commercial fertilizer and stable manure gave slight increments in yield. Stable manure proved particularly effective when supplemented with ammonium sulfate. The author points out that the Early Grano onion probably responds differently to fertilizer than would a longer season variety. He suggests that the profits from onion growing may be increased by more general use of chemical fertilizers, particularly nitrogen, as supplements for stable manure.

Fertilizer placement for cannery peas, C. B. SAYRE and G. A. CUMINGS (*New York State Sta. Bul. 659 (1936), pp. 30, figs. 9*).—In cooperative experiments conducted by the station and the U. S. Department of Agriculture and extending over a period of 3 yr. it was found that applying fertilizer in contact with pea seed reduces yields, whereas the same amount of fertilizer applied separately from the seed will increase the yield. Since the type of drills used commonly in the State distribute seed and fertilizer at one operation, an attachment for a grain drill was devised by means of which fertilizer and seed may be sown in one operation, but with the fertilizer so placed as not to injure the seed. Illustrations and descriptions of the device are presented so that growers and manufacturers may devise effective machinery.

Based on 1 year's results, the authors report that superphosphate alone produced a more economical gain than an equal amount of phosphoric acid in a 4–16–4 formula. Placement of the fertilizer 2.5 in. to the side and 1 in. lower than the seed proved particularly effective. When the distance was increased to 3.5 in. much of the stimulus was lost. Up to the maximum amount used, fertilizer increments placed to the side of the row increased yields without injury to germination or to the young plants. The residual effects of a heavy application of fertilizer in rows for the crop preceding peas did not result in

any inequality in maturity, being apparently offset completely by the application of the fertilizer applied at the side of the pea rows.

Making cannery peas more profitable, C. B. SAYRE (*Farm Res. [New York State Sta.], 2 (1936), No. 3, pp. 5, 12*).—Based on experiments at the station, suggestions are given as to selection of soil, time of planting, choice of varieties, preparation of the seedbed, seed treatment, and fertilization.

Spinach varieties for spring and fall, W. D. ENZIE (*Farm Res. (New York State Sta.], 2 (1936). No. 3, p. 14*).—Results of variety tests are briefly noted.

New wilt-resistant tomato varieties for field and greenhouse, W. A. HUELSEN (*Illinois Sta. Circ. 448 (1936), pp. 20, figs. 8*).—Descriptions are presented of three new *Fusarium* wilt resistant field varieties, Prairiana, Early Baltimore, and Illinois Pride, and five new *Fusarium* wilt resistant greenhouse varieties, Blair Forcing, Sureset Forcing, Urbana Forcing, Lloyd Forcing, and Long Calyx Forcing, all of which were developed at the station. Additional data are presented on the yields of the new varieties as compared with standard varieties.

The Glovel tomato, W. S. POETE, H. S. WOLFE, and W. M. FIFIELD (*U. S. Dept. Agr. Circ. 388 (1936), pp. 6, figs. 3*).—Produced cooperatively by the U. S. Department of Agriculture and the Florida Experiment Station from a cross between the Globe and the Marvel varieties, this pink-fruited local-market and shipping tomato is described in detail and discussed with reference to adaptability, source of seed, etc.

Effect of fertilizer treatments of a soil on the quality and yield of tomatoes, R. P. THOMAS (*Maryland Sta. Bul. 386 (1935), pp. 369–389*).—Marglobe tomatoes grown on both Sassafras loam and Sassafras sandy loam, supplied with nitrogen, phosphorus, and potassium alone and in various combinations and ratios or with stable manure alone and supplemented with phosphorus, responded most strongly in yields to a complete fertilizer high in phosphorus and potassium. Of single materials, stable manure was most effective, superphosphate second, and the combination of the two the most beneficial treatment of all. The application of commercial fertilizer in bands along the row gave a larger percentage of early fruit than did a similar amount broadcasted. Side dressing with a complete fertilizer had no advantage when compared to a single application at the time of setting the plants. Manganese sulfate gave only a slight yield increase.

Samples of fruit harvested in the full ripe stage were canned, with little evidence that fertilizers had any appreciable effect on quality of the product, although there was an indication that an unbalanced treatment, such as manure, nitrogen, or potash alone tended to lower quality. H-ion and total solids of tomatoes were little influenced by fertilizer treatment, but total nitrogen, phosphorus, and potassium contents were increased slightly when these materials were applied.

Directions for spraying fruits in Illinois (*Illinois Sta. Circ. 447 (1936), pp. 25, figs. 3*).—This pamphlet, a revision of Circular 429 (E. S. R., 73, p. 321), presents general information of use to the fruit grower and is prepared in four parts: I, Some General Facts About Insects, Diseases, and Spraying; II, Spray Schedules; III, Preparing and Mixing Spray Materials; and IV, Commercial Preparations.

Spraying program and pest control for fruit crops (*Ohio Sta. Bul. 562 (1936), pp. 48, figs. 22*).—This bulletin is a revision of Bulletin 500 (E. S. R., 67, p. 38) and presents spray schedules for apples, pears, peaches, plums, sweet cherries, sour cherries, grapes, gooseberries, and currants. General information is presented on spray materials, the home preparation of sprays, sprays for summer use, and compatibility of different spray materials, and in addition

there are discussed the spray residue problem, spray injury, weather injury, amount of spray material required per tree, procedure in spraying, spraying outfits, and water supplies. Troubles such as fire blight, peach tree borer, and rodents involving methods of control other than spraying are considered.

Spray residue information for the orchardist and fruit packer, R. H. ROBINSON and M. B. HATCH (*Oregon Sta. Bul. 341 (1935), pp. 22*).—Information is given on the factors complicating spray residue removal, washing solvents and their combinations, washing equipment and suggested procedures for its operation, the operation of the home-made flotation washer by the small orchardist, procedure for the operation of the flotation machine, a method for the determination of acid strength and description of the operation, and on a method for the determination of sodium silicate. In addition, data are presented on the results, as measured in toxic residues, of washing pears and apples sprayed according to different schedules and of the effectiveness of different type washing machines.

Evaluation of length measurement in an experiment with apple trees, F. C. BRADFORD and L. E. JOLLY (*Jour. Agr. Res. [U. S.], 51 (1935), No. 12, pp. 1123–1128*).—Stating that an appraisal of tree growth in terms of weight is often impracticable and that length measurements sometimes convey false impressions because weight of twigs is not directly proportional to length, the authors report from the Michigan Experiment Station that in one lot of 1-yr. material the relationship was represented by the equation $X^3=3.1\ Y$, where X equaled length and Y weight in grams. Two graduated scales for transforming length measurements into terms of weight are offered, the use of either of which represented actual weight increase more accurately than length measurements in nearly 70 percent of the trials. In fact, the application of these scales to paired trees often modified materially and sometimes reversed differences indicated by length measurement. When lots of trees were compared by a graduated scale, differences indicated by length measurement were increased in some cases and decreased in others.

Top and double-working apple trees, R. H. ROBERTS (*Wisconsin Sta. Bul. 432 (1936), pp. 16, figs. 14*).—A general discussion is presented upon principles and practices.

Fertilizer experiments in the Morganthau orchard: Six years' results with nineteen treatments, P. C. COLLISON and L. C. ANDERSON (*New York State Sta. Bul. 661 (1936), pp. 32*).—All of 19 fertilizer treatments included in an experiment carried on over a period of 6 yr. in a Hudson River Valley McIntosh orchard set out in 1915 on a soil of pH 5.5 to 6, of light texture and only medium productivity, increased significantly the yields over no treatment when yields were adjusted on a basis of tree size. All treatments included some form of nitrogen, and of the eight sources of nitrogen used, namely, sodium nitrate, calcium nitrate, ammonium sulfate, cyanamide, urea, Calurea, Ammo-Phos, and Nitrophoska, all gave about equal yield responses. Liming had no apparent influence on yield. In growth, as indicated by trunk increments, all fertilizers gave significant gains over no treatment. Neither phosphorus nor potassium used with nitrogen gave any significant yield or growth responses over nitrogen alone. Increases in the amount of nitrogen gave significant increases in trunk girth in all cases but in some cases increased yields slightly but not significantly; thus growth increments were not consistently followed by yield responses.

In seeking an explanation why applications of very highly concentrated complete materials may be inferior to mixtures containing the same weight of nitrogen, phosphorus, and potassium but made up of older and bulkier materials, the author discusses the presence of additional elements, such as sulfur,

calcium, and chlorine, which may help to buffer the soil solution and also supply additional nutrient ions to the tree.

From a practical standpoint an expenditure of 8 ct. per tree per year gave an annual increase of 2.3 bu. of apples per tree for the four nitrogens, nitrate of soda, sulfate of ammonia, calcium nitrate, and cyanamide. Soil is conceded a more important factor in fertilizer response than size of the tree; in fact adjusting yields for tree size had little effect on the results.

Missouri apple spraying: Recommendations for 1936, T. J. TALBERT, L. HASEMAN, H. G. SWARTWOUT, and C. M. TUCKER (*Missouri Sta. Circ. 190 (1936), pp. 8*).—This comprises spray schedules and supplemental information regarding spray materials, spray injury, and diseases and insects.

The occurrence in pears of metabolic gases other than carbon dioxide, E. HANSEN and H. HARTMAN (*Oregon Sta. Bul. 342 (1935), pp. 10, figs. 3*).—Knowing that very low concentrations of ethylene and related gases can be detected by their effects on living plants, Anjou and Winter Nelis pears were enclosed in airtight containers with young tomato plants or germinating pea seeds. In one case, gases collected from unripened pears held at 31° F. were released into the jars containing the tomato plants. The results showed that the pears produced effects on germinating pea seeds and on young tomato plants that were indistinguishable from those produced by ethylene. Peeled fruits as well as peelings alone were effective, but if the pears had been rendered inactive by freezing or by chloroform there were no effects: indicating that the emanations were associated with the respiratory activities of the fruit. This was further shown by the fact that fruits that had reached a state of senescence caused no plant reactions.

Quantitative measurements of the gas given off by the pears, using the iodine pentoxide reduction method, indicated that the gas was present in concentrations similar to those of ethylene when effective in producing epinasty of tomato leaves. Since acetylene, propylene, carbon monoxide, and butylene would not be effective in such dilute concentrations, the indications pointed to ethylene as the causal agent. Further evidence that ethylene is evolved by pears was obtained by determining the solubility of the emanations in a solution of mercuric nitrate.

Immature Bartlett, Comice, and Anjou pears ripened in from 8 to 15 days when placed in containers with ripe pears. Without the ripe pears ripening was much slower or did not occur at all.

Efforts to improve sweet cherries, F. M. COE (*Farm Res. [New York State Sta.], 2 (1936), No. 3, pp. 1, 8*).—Pointing out the need of cherry varieties with greater yielding capacity and of earlier or later season, the author discusses breeding work with sweet cherries at the station and outlines methods of technic which were employed in 1934 to increase the number of cross-pollinated seeds and to separate potentially viable and nonviable seeds. Observations on station seedlings showed that black × black may yield some white-fruited cherries but that white × white yields only white cherries. Sweetness appeared to be recessive to subacidity. Among the most promising parental combinations were Lambert × Schmidt, Lambert × Giant, Giant × Napoleon, and Napoleon × Giant.

Maraschino cherries gain in popularity, W. F. WALSH (*Farm Res. [New York State Sta.], 2 (1936), No. 3, pp. 8, 10*).—The author discusses the preparation of Maraschino cherries, stating that their manufacture should provide a new outlet for New York sweet cherries and that Napoleon and Yellow Spanish have to date proved the most valuable varieties.

Observations in 1935 on the use of calcium cyanamid in orchards, G. F. GRAY (*Michigan Sta. Quart. Bul., 18 (1936), No. 3, pp. 170–172*).—Follow-

ing observations of numerous cases of leaf scorch and defoliation in the spring of 1934 from applications of calcium cyanamide, a series of plats was laid out in apple, Montmorency cherry, Elberta peach, Bartlett pear, and Lombard plum orchards. No evidence of leaf scorch was found in any orchard in 1935 despite the fact that rainfall was below normal in the northern part of the State. Fall applications of nitrogenous fertilizer stimulated the growth of fall cover crops and in certain cherry orchards seemed to result in larger and greener leaves the next spring. In another cherry orchard defoliation from cherry leaf spot was apparently delayed from 7 to 10 days by fall fertilization.

Observations in 1935 on the trees injured in 1934 by cyanamide showed practically no difference in the number of blossoms per bud and buds per spur or in the percentage of living buds between the injured and uninjured trees. The author suggests, however, that until more is known of the use of cyanamide that it should be applied in the fall or very early in the spring.

Detecting winter injury in raspberries, L. M. COOLEY (*Farm Res. [New York State Sta.], 2 (1936), No. 3, pp. 10, 12*).—Asserting that much winter injury occurred to raspberries in New York State during the winters of 1933–34 and 1934–35, the author points out that there are various degrees of injury and that actual death may not occur. Fruit buds of vigorous red, black, and purple raspberries are said to withstand 30° to 35° F. below zero, with the danger zone in the wood or water-conducting elements of the canes. As an indication of the condition of the canes, it is suggested that the bark be shaved in small patches. If the tissues are white or greenish in color and moist the plants are unhurt, but if brown and dry severe injury is indicated.

Grape growing in Colorado, G. BEACH (*Colorado Sta. Bul. 424 (1936), pp. 14, figs. 6*).—Information of a general nature is presented on propagation, planting, varieties, pruning, winter protection, general culture, harvesting, etc.

Grape growing in Kansas, R. J. BARNETT (*Kansas Sta. Circ. 177 (1935), pp. 32, figs. 13*).—This is a revision of Circular 134 (E. S. R., 59, p. 141) and is for the greater part a presentation of general information on planting, propagation, culture, training, harvesting, marketing, control of various pests, etc. Of four systems of training Concord grapes, namely, the 4-cane Kniffin, 2-cane Kniffin, short fan, and spur, the 2-cane Kniffin gave the largest yields, followed rather closely by the 4-arm Kniffin system. In a 5-yr. test of five varieties, Moore Early, Concord, Worden, Niagara, and Lucile, the Concord and Worden were about equally productive and far more so than the others.

Breeding hardy seedless grapes for New York, A. B. STOUT (*Farm Res. [New York State Sta.], 2 (1936), No. 3, p. 13*).—Progress at the station and in the field is recounted, including mention of the new seedling Bronx Seedless.

Wormseed oil production, G. S. WEILAND, L. B. BROUGHTON, and J. E. METZGER (*Maryland Sta. Bul. 384 (1935), pp. 315–335*).—Stating that American wormseed has been cultivated in Carroll County for more than 100 yr., the authors present general information on culture and distillation, supplemented by the results of fertilizer, cultural, and chemical studies. Ascaridole, the active principle in the oil, was found distributed throughout the plant, with greatest concentration in the seeds. As to time of harvesting, the greatest amount of ascaridole was found in plants that had matured to the stage when most of the seeds were dark.

Tests of various fertilizer combinations indicated that phosphorus and potash are more important than nitrogen, and led to the recommendation of from 300 to 500 lb. per acre of a 3–12–6 or a 2–9–5 mixture for wormseed grown on Manor or Chester soils. The use of high proportions of potassium caused the greatest increases in ascaridole.

A survey of the stills showed that much oil is lost in the waste liquor, with only a few operators equipped for redistillation. The plant residue left after distillation was fed exclusively to young rams for 9 weeks, with no indication of a toxic effect. Rapid drying of the refuse is suggested as a means of preventing molding.

The quality of flower seeds on sale in New York, M. T. and R. E. MUNN (*New York State Sta. Bul. 663 (1936), pp. 12*).—Of a total of 500 packets of flower seeds purchased on the open market, 57 percent were found, on the basis of purity and germination tests, to contain seeds which were excellent, good, or entirely satisfactory for planting purposes. The remaining 43 percent were found either unsatisfactory or nearly worthless; in fact 15 percent were classified as apparently absolutely worthless. The seedsmen who supplied seed seemed to fall into two general classifications, (1) those who produce high grade stock, and (2) those who are apparently unconcerned with quality.

FORESTRY

Forest trees and forest regions of the United States, W. R. MATTOON (*U. S. Dept. Agr., Misc. Pub. 217 (1936), pp. 55, pls. 14, figs. 11*).—The purpose of this paper is to present in simple form the names of all the tree species of the continental United States with their geographic ranges and distinguishing characteristics and to describe briefly the various natural forest regions (including Puerto Rico and Hawaii), supplemented with the names of the principal trees.

The relationship between tree-growth and stream runoff in the Truckee River Basin, California-Nevada, G. HARDMAN and O. E. REIL (*Nevada Sta. Bul. 141 (1936), pp. 38, figs. 15*).—An analysis of increment cores taken from about 200 western yellow pine trees growing in the intermediate zone (5,500 to 8,000 ft.) indicated that variations in the thickness of the annual rings correspond rather closely to variations in stream flow. Rings from trees growing at the higher elevations where moisture was more abundant were much less variable than those taken from trees at lower levels. The precipitation of the region from which the samples were collected, including the Truckee River drainage basin and the southeastern portion of the Feather River Basin, is said to rarely exceed 30 in. a year, with the average considerably less. The bulk of the precipitation occurs in the winter season in the form of snow.

Deductions from the study are that in the last four centuries stream flow in the Truckee River has varied within rather wide limits, with relatively long periods (from 10 to even 30 or 40 yr.) when the flow was near the average or was far above or below. The indications were that the 40 yr. from 1875 to 1915 formed the longest period in which the flow of the Truckee River was above average in the nearly 300 yr. ended 1930. Obviously records of stream flow taken during this high period failed to give a true picture of the available water for irrigation. Nothing in the tree ring record indicated that dry or wet periods follow any definite sequence that permits predictions for the future.

The correlation coefficient between tree growth and stream run-off on the Truckee River over a period of 26 yr. was computed as 0.888 ± 0.028. Similar figures for several streams on the west slope of the Sierras support the assumption that precipitation has a similar effect upon both tree growth and stream flow, and that run-off can be estimated from tree growth.

The methods of technic employed in the study are discussed in detail with measuring devices described, and the basic data are given in an appendix.

The status of the southern shortleaf pine in the northwestern Ozark region, L. M. TURNER (*Ill. State Acad. Sci. Trans., 28 (1935), No. 2, pp. 115, 116*).—This is a brief contribution from the Arkansas Experiment Station in which the author discusses present distribution of the species, difficulties in propagation, susceptibility of young plants to winter injury, etc. He concludes that the species is waning in northern Arkansas, southern and eastern Missouri, and southern Illinois.

Growth and seasonal changes in composition of oak leaves, A. W. SAMPSON and R. SAMISCH (*Plant Physiol., 10 (1935), No. 4, pp. 739–751, figs. 4*).—Analyses at the University of California of the leaves of *Quercus gambelii* collected in Utah and *Q. kelloggi* collected in California showed that protein accumulates at a very early stage of development, and since no more N was taken up by the leaves as they expanded, the protein content per unit area decreased. In the latter stages there was an actual loss in N by retranslocation to the wood. Ether-soluble substances accumulated continuously throughout the growing season. Most of the crude fiber was accumulated early in the growth period. N-free extract increased very rapidly in California oak in the early season, whereas in the Utah species the accumulation was gradual throughout the entire growing period. K increased rapidly in the spring, slowly in the summer, and with definite translocation back to the tree in autumn. P reached a maximum much earlier in the California species than in the Utah.

The influence of seed inoculation upon the growth of black locust seedlings, D. W. THORNE and R. H. WALKER (*Jour. Amer. Soc. Agron., 28 (1936), No. 1, pp. 28–34, fig. 1*).—Using an inoculant isolated from nodules collected from roots of black locust, it was observed in these studies, conducted jointly by the Iowa Experiment Station and the U. S. D. A. Soil Conservation and Forest Services, that the treatment of locust seed resulted in better growth and higher survival. The increase in total nitrogen of the seedlings as a result of inoculation was 297.2 percent on a soil of low fertility and 80.4 percent on a soil of rather high fertility. Nodule formation was greater in the inoculated trees, and the nodules were generally located much nearer the taproot and closer to the surface. Cross inoculation tests showed the root nodule bacteria of soybeans, cowpeas, and wood clover to be incapable of producing nodules on black locust.

Storage of some coniferous seeds, L. V. BARTON (*Contrib. Boyce Thompson Inst., 7 (1935), No. 4, pp. 379–404, figs. 4*).—Of various storage treatments tested for coniferous seeds, sealed storage at low temperature was particularly effective in maintaining vitality. Loblolly pine seeds under sealed, low temperature conditions retained their seedling-producing power fully for 7 yr. as compared with a decided decline in vitality after 1 yr. of open room storage. Longleaf pine lost its viability completely in 1 yr. of open room storage but germinated 50 percent after 5 yr. of sealed, low temperature storage. In ordinary room temperature a vacuum favored the retention of viability, and both vacuum and low temperature overcame in part the harmful effects of artificial drying. The treatment of fresh or stored seeds of *Pinus Taeda, P. caribaea,* and *P. echinata* and to a lesser extent *P. ponderosa* in moist granulated peat at 5° C. for 1 or 2 mo. prior to planting resulted in an increased seedling production. Seeds of *P. resinosa, Picea excelsa,* and *P. canadensis* required no pretreatment.

Stumpage and log prices for the calendar year 1934, compiled by H. B. STEER (*U. S. Dept. Agr., Statis. Bul. 51 (1935), pp. 61, figs. 3*).—This is the usual statistical report (E. S. R., 73, p. 54) upon price levels and demands for stumpage and logs during the calendar year 1934.

DISEASES OF PLANTS

The Plant Disease Reporter, March 15 and April 1, 1936 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 20 (1936), Nos. 5, pp. 82–94, figs. 2; 6, pp. 95–119, figs. 7*).—Among other items of interest, these issues contain the following notes:

No. 5.—*Neetria* canker of pear (*N. galligena* attacking bark below the soil surface), by S. M. Zeller and L. P. Wilcox; bean and pea diseases in Colorado in 1935, by W. J. Zaumeyer and B. L. Wade; losses from corn ear rots in Illinois in 1935, by L. R. Tehon and B. Koehler; tests with cotton wilt in Arkansas, 1935, by V. H. Young; some observations on tobacco diseases in North Carolina in 1935, by R. F. Poole; an early record of *Septoria* leaf spot of peony in Oregon (*S. paeoniae berolinensis*, collected by H. P. Barss in 1914 and apparently the first record of the fungus in the far West); and observations of interest on nematode diseases of plants (including new hosts for the root knot nematode (*Heterodera marioni*), occurrence of the meadow nematode (*Anguillulina pratensis*), *A. dipsaci* on *Tigridia pavonia*, and *Cephalobus elongatus* on potato and iris), by G. Steiner and E. M. Buhrer.

No. 6.—The Utah tomato disease situation in 1935 (including data on curly top, *Verticillium alboatrum* wilt, *Aplanobacter michiganense* [=*Phytomonas michiganensis*] canker, mosaic, and streak), by H. L. Blood; summary of potato disease records from certification inspections in Nebraska for the past 5 yr., by R. W. Goss; notes on blueberry fungi, by M. S. Wilcox; the 1935 stem rust epiphytotic in South Dakota (*Puccinia graminis* on wheat), by H. H. Klages; second experimental forecast of the incidence of bacterial wilt of corn, by N. E. Stevens; and leaf reddening in winter oats in western Oregon, by R. Sprague.

[Abstracts of papers presented at the eighth annual meeting of the academy] (*Jour. Colo.-Wyo. Acad. Sci., 2 (1935), No. 1, pp. 49, 52*).—The following two papers are of interest to phytopathology: Occurrence of Peach Mosaic in Western Colorado, by E. W. Bodine, and The Effect of Temperature and Humidity Upon "Corking-Over" Processes in Wounded Potato Tubers and the Relation to Dry Rot Infection, by G. H. Starr.

[Plant disease studies in Colorado] (*Colorado Sta. Rpt. 1935, pp. 8, 11*).—Notes are given on studies in control of bacterial wilt and winter killing in alfalfa and peach mosaic.

Injuries due to diseases and pests of forage plants and methods for their control [trans. title], E. Baudyš (*Československ. Akad. Zeměděl., Časové Otázky Zeměděl. (Czechoslovak Acad. Agr., Agr. Topics), No. 49 (1935), pp. 220–226*).—This is a general summary of bacterial and fungus diseases and of insect and other pests of forage plants.

Plant pathology [at the Philippine Bureau of Plant Industry] (*Philippine Bur. Plant Indus. Ann. Rpt., 1934, pp. 76–85, pls. 2*).—Progress reports are given, including studies of the grass hosts of *Rhizoctonia solani* other than rice; peanut wilt due to *Sclerotium rolfsii;* citrus blight due to *Phytophthora faberi;* a serious mango root rot associated with *Pythium;* a mango bark disease of as yet undetermined cause; the control of the black pod and other diseases of cacao; control of bunchy top disease of abacá; anthracnoses of cotton shown to be due to five strains of *Gloeosporium;* a cotton disease due to *Helminthosporium gossypii;* tobacco wilt due to *Phytomonas solanacearum* [*Bacterium solanacearum*]; green spot disease of wrapper tobacco due to a fungus; potato tuber diseases; *Fusarium* root rot of strawberries; a cauliflower disease shown to be due to the joint action of a *Phytomonas* and an *Alternaria;* bunt of rice; a new or little-known *Fusarium* disease of rice; black tip of

bananas due to a fungus resembling *Helminthosporium torulosum;* the sclerotial stem rot of everlasting; damage by, and control of, destructive diseases of celery, cabbage, and other vegetable crops; and comparative studies of the green fluorescent bacterial phytopathogens. Miscellaneous data from the plant quarantine and regulatory service include inspection of incoming and outgoing plants and entomological and pathological interceptions.

Report on the work of the mycological division, M. PARK ([*Ceylon*] *Dir. Agr., Admin. Rpt., 1934, pt. 4, Ed., Sci., and Art (D), pp. 124–131*).—The following matters of interest are included: A list of 19 species of fungi causing diseases in 24 host plants as recorded for the first time in Ceylon, and a list of 3 new hosts for the eelworm (*Heterodera marioni*); general observations on diseases of rubber (*Hevea*), tea, coconuts cacao, cereals, green manure crops, fruit trees, tobacco, etc., and a list of 10 plant diseases not noted in previous reports; progress reports on investigations of *Thielaviopsis paradoxa* on coconuts, of control of the common diseases of citrus, of the "sudden death" disease of cacao due to marked fluctuations in rainfall, and of control of the coconut beetle (*Oryctes rhinoceros*) by trap crops infected with the green muscardine fungus (*Metarrhizium anisopliae*); and of "seed" ginger treatment with mercuric chloride for control of the soft rot here reported to be due to *Pythium graminicolum*, of the comparative pathogenicity of strains of *Ustulina zonata* from different hosts on tea and rubber, and of fungicide substitutes for bordeaux mixture, which are needed because of the poor quality of the lime in Ceylon.

Notes on some fungi from Colombia, F. D. KERN and R. A. TORO (*Mycologia. 27 (1935), No. 6, pp. 615–617*).—This joint contribution from the Pennsylvania State College and the University of Puerto Rico includes, among other things, *Phyllachora machaericola*, reported for the first time from Colombia; *Septoria cucutana* n. sp. on leaves of *Tecoma pentaphyllae; Uromyces hedysaripaniculati* on *Desmodium scorpiurus;* and *U. proeminens* on *Chamaesyce hypericifolia*, the last two hosts apparently new for Colombia.

Some aspects of the plant virus problem, K. M. SMITH (*Sci. Prog. [London], 30 (1936), No. 119, pp. 413–421, pls. 2, fig. 1*).—This address before the British Association for the Advancement of Science gives a short survey of the plant virus problem, including discussions of the nature and size of the virus particles; the types of disease induced (mosaic, destructive, and overgrowth types); methods of transmission; the mechanism of virus movements within the plant; the immunity and cross-immunity relations; and the serological diagnosis of viruses. A figure illustrates the comparative sizes of representative animal and plant viruses, bacteriophages, oxyhemoglobin, and of a typical bacillus.

The address concludes with a short account of a new virus of tobacco, apparently present in the roots but not in the stems, failing to induce any signs of disease during the whole life of the plant, but under certain conditions in the winter and spring passing up into the plant and causing disease symptoms in the lower leaves. Three possible explanations of the condition are discussed.

Atypical and pathological multiplication of cells approached through studies on crown gall, A. J. RIKER and T. O. BERGE (*Amer. Jour. Cancer, 25 (1935), No. 2, pp. 310–357, figs. 3*).—This general survey treats of the morphological relations of crown gall bacteria and the infected host tissues, the physiological relations (including those of the bacteria, growth-stimulating substances, resistance and antibodies, dissociation, radiation, and the physiology of the host plant), and crown gall bacteria in relation to animal tissues. The final section presents general discussions of promising subjects for further

study and of some experimental procedures for examining possible causal agents. A bibliography seven pages long is included.

Gasterella, a new uniloculate Gasteromycete, S. M. ZELLER and L. B. WALKER (*Mycologia, 27 (1935), No. 6, pp. 573–579, figs. 13*).—In this contribution from the Oregon Experiment Station the authors describe and illustrate *Gasterella lutophila* n. g. and sp. (Protogastrales, having closest affinities with *Hymenogaster*), found on moisture-saturated soil.

Spumula, a new genus of rusts, E. B. MAINS (*Mycologia, 27 (1935), No. 6, pp. 638–641, fig. 1*).—*S. quadrifida* n. g. and sp. is described from herbarium material of *Calliandra bijuga* from Mexico. It is related to *Ravenelia* and *Cystomyces*, apparently being closer to the former.

Notes on the occurrence of Tuberculina maxima on the aecia of Cronartium cerebrum, G. G. HEDGCOCK (*Phytopathology, 25 (1935), No. 12, pp. 1117, 1118*).—"Since *T. maxima* was collected so infrequently, it must be concluded that it is rare and of no economic importance on *C. cerebrum*."

Notes on some species of the Uredinales, G. B. CUMMINS (*Mycologia, 27 (1935), No. 6, pp. 605–614, figs. 5*).—This contribution from the Indiana Experiment Station presents miscellaneous notes on rusts, including *Goplana dioscoreae* n. comb.; *Puccinia parksiana* n. sp. on *Smilax vitiensis;* telia of *P. liberta;* a discussion and redescription of *Uromyces americanus*, with its removal from the synonymy as a valid species; further characterization of *U. scirpi;* and *Pucciniastrum ericae* n. comb.

The use of zinc sulphate under corn and other field crops, R. M. BARNETTE, J. P. CAMP, J. D. WARNER, and O. E. GALL (*Florida Sta. Bul. 292 (1936), pp. 51, figs. 14*).—White bud, a nutritional disorder of corn frequent in the central, northern, and northwestern part of the State, prevails particularly in fields kept in culture annually. When severe, many plants die and the growth of those remaining is unsatisfactory. Careful experimentation indicated that the development of this chlorosis may be wholly prevented by application of $ZnSO_4$ in relatively small quantities in the row before planting or of animal manures to the soil, and that it may be at least partially prevented by application of certain types of rough or crude organic materials such as leafmold to the soil or by practicing "land-resting" or fallowing for from 1 to 2 yr.

In fields of Norfolk and Hernando medium fine sands in which white bud had developed severely for several years, 12 lb. per acre of 89 percent $ZnSO_4$ mixed with a 5–5–5 fertilizer made from nitrate of soda, cottonseed meal, superphosphate, and muriate of potash prevented the white bud condition and gave greatly increased grain yields. Fifteen lb. per acre of 89 percent $ZnSO_4$ applied separately but in conjunction with 0–4–4 and 7.5–4–4 fertilizer made from urea, superphosphate, and muriate of potash prevented white bud, gave greatly increased grain yields, and increased the efficiency of the urea. In tests on rates of application, from 10 to 20 lb. per acre of 89 percent $ZnSO_4$ applied in the row separate from, but in conjunction with, a complete fertilizer, proved the most efficient rates. When applied in the row before planting, it increased the efficiency of side dressing with nitrate of soda. In seven field tests, 20 lb. per acre of 89 percent $ZnSO_4$ were applied, mixed with 4–0–4 and 4–8–4 inorganic fertilizers made from nitrate of soda, superphosphate, and muriate of potash. The corn yields showed that there is a mutual interference in the response of corn to phosphate and zinc fertilization when superphosphate and $ZnSO_4$ are mixed before application in the row. The increase in corn yields was higher when $ZnSO_4$ was applied separately from the inorganic 4–8–4 mixture than when it was mixed directly with the fertilizer before application in the row. The mutual interference of superphosphate and $ZnSO_4$ was not observed when

cottonseed meal was used as a source of part of the nitrogen in 4–8–4 mixtures made from nitrate of soda, cottonseed meal, superphosphate, and muriate of potash.

Peanut yields were increased in some instances when $ZnSO_4$ was mixed with inorganic 4–8–4 and 4–0–4 fertilizer mixtures made from nitrate of soda, superphosphate, and muriate of potash. The increases in dry nut yields attributed to $ZnSO_4$ were neither as large nor as consistent as those with corn. No physical symptoms of malnutrition were observed on peanuts growing on soils producing white bud of corn.

Oats on land which had produced white bud of corn responded favorably with increased yields to application of $ZnSO_4$ in or between the drill rows. No definite physical symptoms of malnutrition were observed in the plats without it, but the oats with $ZnSO_4$ matured approximately 2 weeks before those without it.

Yields of green top growth of velvetbeans, cowpeas, and Pearl millet on land producing white bud of corn were increased by application of $ZnSO_4$ in the row before planting. Plants in plats without it developed definite physical symptoms of malnutrition which were not observed in plats receiving applications in the row before planting.

Yields of green top growth of sugarcane, Napier grass, *Crotalaria spectabilis*, and *C. intermedia* on land producing white bud corn were increased definitely by application of $ZnSO_4$ in the row before planting. To date, no definite physical symptoms of malnutrition in these plants have been observed when grown without it.

Progress in zinc sulphate studies, A. F. Camp and W. Reuther (*Fla. State Hort. Soc. Proc., 48 (1935), pp. 59–61*).—This contribution from the Florida Experiment Station summarizes briefly the results of experiments with zinc sulfate in the control of citrus mottle leaf and the effects on the fruit of sprays containing zinc.

Origin and production of morphologic and pathogenic strains of the oat smut fungi by mutation and hybridization, C. S. Holton (*Jour. Agr. Res. [U. S.], 52 (1936), No. 4, pp. 311–317, fig. 1*).—From this study by the U. S. D. A. Bureau of Plant Industry, in cooperation with the Washington Experiment Station, evidence is presented that the fungus causing the buff smut of oats arose as a result of mutation in *Ustilago levis*. It resembles *U. levis* in all respects except in the color of the chlamydospores, and consequently the change involved only the factor responsible for chlamydospore color. This change in the color factor apparently occurred during meiosis in a germinating chlamydospore, with the result that one of the four haploid nuclei lost the factor for brownness. This nucleus became located in the apical cell of the promycelium, and all crosses with the monosporidial line derived from this cell gave rise to heterozygous brown chlamydospores and the hyaline spores of the buff smut fungus were segregated in the second generation. The appearance of the hyaline chlamydospores in this generation is explained on the basis of independent segregation of factors for sex and color of chlamydospores.

The heritable nature of pathogenic properties in the oat smut fungi is clearly demonstrated by the results of studies on crosses of *U. avenae* with *U. levis* and with the buff smut fungus. A pathogenic strain of *U. levis* attacking Gothland and Monarch was produced by crossing a Gothland strain of *U. avenae* and a Monarch strain of *U. levis*. Also, a new pathogenic strain of the buff smut fungus attacking Gothland and Monarch was produced by crossing the Gothland strain of *U. avenae* with the Monarch buff smut strain. The new buff smut strain was as virulent on Gothland as the *U. avenae* parent but somewhat less virulent on Monarch than the buff smut parent.

Reaction of oat varieties to physiologic races of loose and covered smuts of red oats, G. M. REED and T. R. STANTON (*Jour. Agr. Res.* [*U. S.*], *52* (*1936*), *No. 1, pp. 1–15*).—Data for collections of loose smut (*Ustilago avenae*) and covered smut (*U. levis*) from the southern oat-growing regions of the United States on varieties of *Avena* spp. were obtained. The covered smut is a specialized race which severely infected the Fulghum and Black Mesdag varieties, the latter hitherto recognized as extremely resistant to all races of both smuts. Nine collections of loose smut were specialized to Fulghum. Red Rustproof was not infected by either the Fulghum covered or loose smut, although both occurred on several varieties of common oats. Definite evidence was also obtained, indicating further specialization of the Fulghum smuts into distinct subraces. Red Rustproof is attacked by a highly specialized race of loose smut which does not infect Fulghum, but which occurs on Canadian and on at least one strain of *A. fatua*. Markton and Navarro proved resistant to all the collections.

A note on the occurrence in New South Wales of black chaff of wheat caused by Bacterium translucens var. undulosum S. J. and R., J. G. CHURCHWARD (*Roy. Soc. N. S. Wales, Jour. and Proc., 68* (*1934*), *pt. 2, pp. 104–106*).—The isolation and infection experiments reported demonstrated the presence of this disease in New South Wales in 1934, and descriptive records apparently indicate that it had been there for several years before. Preliminary tests indicated that the hot-water treatment for loose smut of wheat also reduces black chaff infection.

Studies on the nature of disease resistance in cereals.—III, The organic nitrogen content of mature and immature tissues of the wheat plant in relation to stem-rust resistance, T. and O. JOHNSON (*Canad. Jour. Res., 13* (*1935*), *No. 6, Sect. C, pp. 355–357*).—In the six varieties analyzed about 1 week prior to the emergence of the flag leaf, the nitrogen content of the mature tissues (the fully grown leaves of the upper half of the plant) was greater than that of the immature ones (leaves folded within the uppermost sheaths). Thus, the greater susceptibility of the younger tissues to *Puccinia graminis tritici* cannot be attributed to a higher organic nitrogen content.

The effect of light intensity and temperature on infection of Hope wheat by Puccinia graminis tritici, H. HART and K. ZALESKI (*Phytopathology, 25* (*1935*), *No. 12, pp. 1041–1066, figs. 6*).—This contribution from the Minnesota Experiment Station in cooperation with the U. S. D. A. Bureau of Plant Industry is summarized as follows:

"The present work offers evidence that there is an optimum light intensity for mycelial development and sporulation of *P. graminis tritici* in Hope wheat. Under normal intense sunlight of the upper Mississippi Valley, plants of Hope wheat in various stages of development beyond the seedling stage appear to have considerable resistance to *P. graminis tritici* 21. When light intensity is reduced by shading the plants they are completely susceptible to *P. graminis tritici* 21, just as they are completely susceptible in their seedling stages.

"High temperatures have an effect similar to that of intense sunlight, so that plants appear resistant to rust.

"The external environmental factors, light and temperature, seem to influence the host-parasite complex rather than its component parts."

Studies on seven differentiating characteristics of two physiologic forms of Tilletia tritici, C. S. HOLTON (*Phytopathology, 25* (*1935*), *No. 12, pp. 1091–1098, figs. 3*).—In this cooperative study between the Washington, Oregon, and Idaho Experiment Stations and the U. S. D. A. Bureau of Plant Industry, seven differentiating characteristics were established between two physiologic forms of *T. tritici* attacking the wheat variety Hohenheimer (C. I. 11458).

Aside from differing in pathogenic properties in Hohenheimer, they differed also in the type of smut ball, the prominence of the spore-wall reticulations, the size of the spores, the length of the promycelia, and the nuclear behavior during chlamydospore germination. On the variety Hosar (C. I. 10067), they differed also in the degree of stunting of the host. This appears to be the largest number of ways in which two physiologic forms of *T. tritici* have been found to differ. Three of these differences (size of chlamydospore, length of promycelia, and nuclear behavior) apparently have not been previously reported.

While it is recognized that from an economic point of view differences in the pathogenicity of physiologic forms of *T. tritici* and *T. levis* are more important than other differences, it also is recognized that in view of published reports pathogenic properties may vary under different conditions. Thus it cannot be expected that the pathogenic reactions of physiologic forms of these organisms will be the same everywhere. In view of the great need for a uniform system of identifying and numbering physiologic forms of *T. tritici* and *T. levis*, it would, therefore, perhaps be wise to take into account differences, other than pathogenicity, between forms.

Disease-free and disease-resistant beans, J. C. WALKER (*Canner, 82 (1936), No. 11, II, pp. 59, 60*).—This contribution from the University of Wisconsin summarizes the present status of, and progress of studies on, seed treatment and resistant varieties with respect to anthracnose, bacterial blights, and mosaics of beans.

More new host species of the clover stem rot (Sclerotinia trifoliorum), G. NILSSON-LEISSNER (*Bot. Notiser, 1935, No. 6, pp. 505, 506, fig. 1*).—This note lists 22 additional host species.

Some factors affecting infection with and spread of Diplodia zeae in the host tissue, J. R. HOLBERT, P. E. HOPPE, and A. L. SMITH (*Phytopathology, 25 (1935), No. 12, pp. 1113, 1114, fig. 1*).—In this note on *D. zeae* from the Illinois and Wisconsin Experiment Stations in cooperation with the U. S. D. A. Bureau of Plant Industry, various predisposing factors for its infection and spread are reported. In each case cited, the increased susceptibility of the stalks to infection was asociated with conditions that might well have resulted in a reduction of the carbohydrate reserves of the corn plant, but apparently this situation did not hold for susceptibility in the ears.

Factors affecting the development of corn smut, Ustilago zeae (Beckm.) Unger, J. M. WALTER (*Minnesota Sta. Tech. Bul. 111 (1935), pp. 67, figs. 4*).—Mutilation of corn by slashing, detasseling, or topping markedly increased smut severity when done at an intermediate stage of rapid development but was ineffective at other stages. The internodal and lateral meristems were involved in the increases, and response to the detasseling or topping evidently depends on the host genotype.

The application of large amounts of inoculum to portions of the plant reached by meteoric water did not increase the prevalence and severity of smut above natural infections, and this was true of both injured and noninjured plants during four seasons. It is concluded that there usually is an abundance of inoculum, and that the degree of its effectiveness is markedly influenced by environmental factors affecting the host, as well as by inherent characters of the host. Injection of sterilized water into the leaf spirals between the 12- and 20-in. stages greatly increased the total severity of smut, apparently by making connection between the inoculum-containing meteoric water and the susceptible tissues lower in the roll of leaves. Rolling the leaf spirals between the palms during or immediately after rains, simulating the spiral loosening effects of the wind, increased the severity of smut if done on plants between the 12-in. and

early boot stages. The effectiveness of this method of injury increased with the advance of the season, as was true for the injection of sterilized liquids.

Plants of the Rustler variety with early-season leaf smut developed more late-season, nodal-bud smut than plants escaping early-season smut. Direct infection through young husks caused ear smut in some lines, but apparently is not very common. Vigorously growing plants of the Rustler variety on low land well supplied with moisture developed less smut than plants on land lacking sufficient moisture. However, Northwestern Dent, under the same conditions, did not respond in the same manner. The most rapid increase of smut on Rustler (adapted to southern Minnesota and most commonly smutted in the nodal buds) came later in the season than the period of most rapid increase on the Crookston strain of Northwestern Dent (early maturing and adapted to northern Minnesota). Galls ordinarily were well distributed on Northwestern Dent. In general, smut was more destructive to later than to early plantings.

Commercial fertilizers and manure did not cause pronounced growth responses of corn during these experiments, and smut development was not significantly affected by them. However, Rustler, growing vigorously on a fertile field in 1932, developed less smut than the same strain planted about the same time on a less fertile field. Cultivation practices decidedly affected the vigor of corn in 1931, but the total prevalence of smut was not related to the vigor of the plants. A direct relationship between host vigor and susceptibility to smut was noted only for plants of extremely low vigor. There was no correlation between the relative heights of the growing tips at the 1-ft. stage and the smut reactions of 81 Minnesota selfed lines representing field, sweet, flint, and popcorn varieties and none between the resistance of their leaves to puncture and the smut reactions of selfed lines differing distinctly in both respects.

It appears that sustained rapid development of plants to full stalk size in many cases favors escape from or resistance to smut, and that development of large smut galls later in the season depends on lateral meristem activity.

Seed transmission of Helminthosporium of corn, W. D. VALLEAU (*Phytopathology, 25 (1935), No. 12, pp. 1109–1112*).—In this study at the Kentucky Experiment Station, *Helminthosporium* sp. was rarely found in culture-dish tests of corn seeds, but when seedlings were grown in sterilized sand in an ordinary room, where the second node was pushed above the sand surface, the seedlings were eventually killed by seed-borne organisms. These organisms were found to be distributed throughout the length of the seed in the pericarp layers, to have entered the seed before the milk stage, and to be so well sealed between the pericarp layers that escape was frequently not possible in culture-dish tests. The more flinty the endosperm and the more compact the pericarp layers, the less was the likelihood of escape of the organisms before the seed coats were partially broken down. During germination in sand, *Fusarium moniliforme* appeared to cause a reddish seed coat discoloration, *Alternaria* sp. an olive-green discoloration, *Sclerotium* sp. minute, brownish sclerotia, and *Helminthosporium* sp. coal-black areas on the seed coats. On the black areas and sometimes on the mesocotyl, *Helminthosporium* sp. fruited on 11.9 percent of the seedlings from 13 of 15 ears of corn which would ordinarily have been considered nearly fungus-free. Of Boone County White corn 28.5 percent of 2,058 seeds, and of the Reid Yellow Dent 47.4 percent of 1,069 seeds, developed black markings, suggesting the presence of *Helminthosporium*.—(*Courtesy Biol. Abs.*)

Apparatus and procedure for separating cotton root rot sclerotia from soil samples, C. H. ROGERS (*Jour. Agr. Res. [U. S.], 52 (1936), No. 1, pp. 73–79, figs. 3*).—In this contribution by the Texas Experiment Station, the importance

of the sclerotial stage of *Phymatotrichum omnivorum* in perpetuating the root rot disease in central Texas is discussed. Mechanical apparatus and procedures for separating sclerotia from soil for laboratory studies are described. The machine used in the initial separation consists of an 8-mesh vertical cylinder screen with agitator and water inlet at the base and a lower 35-mesh screen onto which washings fall. The lower screen moves in a reciprocating manner in a drain vat filled with water. Power is supplied by a small electric motor. Along with sclerotia, about ½ to 1 gal. of shell or gravel residue is left in washing 1 bbl. of soil. Sclerotia are floated from the heavier shell and gravel by stirring in a sugar solution of from 1.15 to 1.25 sp. gr.

Copper dusts control celery early blight, R. NELSON and L. C. COCHRAN (*Michigan Sta. Quart. Bul., 18 (1936), No. 3, pp. 163–169, figs. 3*).—This is a discussion of the destructive epidemic of *Cercospora apii* infection in 1935, a warning against the probability of another in 1936 (from overwintering of the fungus in trash), and records of the results of dusting experiments of 1935, in which the disease was controlled equally well under very severe test conditions by the copper-lime and the Cuprocide dusts.

General directions are given for the control of celery leaf blights, the fungi of which are seed borne, by seed treatment and by dusting or spraying from four to five times in the seedbed and at from 7- to 10-day intervals in the field. When irrigated, the schedule should be so arranged that the plants will dry before night.

Must conquer diseases to succeed with hops, J. G. HORSFALL and R. O. MAGIE (*Farm Res. [New York State Sta.], 2 (1936), No. 3, p. 2, figs. 3*).—This note reports powdery and downy mildews (the latter new to most New York growers) as limiting factors for hop production in the State. Red copper oxide spray (1–50) gave satisfactory control without the injuries to leaves and cones caused by bordeaux treatment.

A physiological study of the yellows disease of mangel wurzels and the losses caused thereby [trans. title], J. F. VAN RIEMSDIJK (*Tijdschr. Plantenziekten, 41 (1935), No. 12, pp. 317–329, fig. 1; Fr. abs., pp. 328, 329*).—As compared with the normal, the leaves of diseased plants were less long and pointed but heavier and thicker. They were more subject to rust (*Uromyces betae*) and their stomata opened less, but their dry weight, carbon dioxide output, and sugar content (hexoses, saccharose, and maltose) were greater. Furthermore, the diseased leaves absorbed and transpired water less readily than the healthy ones. From these data the author concludes that the starch accumulation characterizing the diseased leaves cannot be due to an enzyme disturbance, but must be attributed to a stagnation in carbohydrate transport, which in turn is due to the "gummosis" of the phloem conducting elements.

In the diseased plants the growth of the roots and their dry weight and sugar content were reduced. When the disease had spread to half of the plant it caused a diminution of 10 percent in yield. The affected plants behaved as if their leaves had been cut off, resulting in an increase in the heart leaves, which in turn contributed to the exhaustion of the roots. Healthy plants reestablished themselves sooner after transplantation, and their wilted leaves recovered more quickly than affected plants.

All considered, there appears to be a sufficient correspondence between the yellows of beets and the leaf roll of potatoes to warrant the conclusion that the former, also, is a virus disease.

Diaporthe phaseolorum on pepper fruits, C. M. TUCKER (*Mycologia, 27 (1935), No. 6, pp. 580–585, figs. 11*).—This paper from the Missouri Experiment Station reports studies of a disease of both green and mature pepper fruits (*Capsicum annuum*), shown to be due to a form of *D. phaseolorum*, with a

Phomopsis imperfect stage. The connection between these two stages was shown by cultural methods, and it is suggested that this fungus furnishes convenient material for the demonstration of nuclei in the developing ascus.

Physiological experiments with the potato plant, D. A. VAN SCHREVEN (*Landbouwk. Tijdschr. [Amsterdam], 47 (1935), No. 579, pp. 706–726, figs. 8; Eng. abs., pp. 721–726*).—Experiments were carried out with potato plants in water and in sand cultures to determine the symptoms of certain deficiency diseases and the toxic effects of manganese, copper, and coarse salt, with the following conclusions:

Nitrogen deficiency is characterized by a uniform light- to yellowish-green color over the whole plant, restricted aerial growth, abnormally elongated and thin roots, and small tubers. In phosphorus deficiency the petioles and the leaflets and their margins bend upward, the leaflets are smaller and darker than normal, the plants more or less stiff, and the roots and tubers feebly developed. With potash deficiency the margins of the leaflets bend downward, the leaves become darker green and later a characteristic bronze or yellow color, the interveinal leaf tissues curve strongly upward, the ratio of length to width of leaf is diminished, the stolons are shortened, and the roots and tubers are poorly developed. When both potash and nitrogen are omitted the abnormally dark green of the leaves is absent, the interveinal tissue is more strongly curved upward, and the margins are curved downward more than normal, the plants are small, and the roots and tubers are poorly developed. With both phosphorus and nitrogen deficient, the petioles, leaflets, and leaf margins have a still more pronounced upward direction than with the phosphorus deficiency alone, but the leaves are lighter in color, the plants are dwarfed and very stiff, the leaflets small, and the roots and tubers very poorly developed. With both potash and phosphorus omitted, the shape and color of the plants are normal, but growth in the stems, roots, and tubers is strongly checked. The results are similar when potash, phosphorus, and nitrogen are all omitted, except that the effects are more pronounced.

In magnesium shortage there is a chlorosis beginning at the tips of the lower leaves and advancing along the margins and between the veins until the whole leaf is involved, and proceeding from the lower part to the tip of the plant. The growth of the roots and tubers is checked very strongly. With excess of nitrogen the symptoms become more severe. Calcium deficiency first becomes apparent as a light-green band along the margins of the young leaves in the bud, and in severe cases the young leaves at the top remain folded, the top of the plant later dying. In the tubers a "medullary necrosis" develops. Lack of boron is characterized mainly by a dying of the growing points, a curling of the leaf margins, a thickening of the leaf blade, and a chlorotic appearance. In severe cases anthocyanin is developed, the internodes become short, the plants stiff, the petioles brittle, and the roots short, thick, and brownish. Often the tubers are small and the surface bursts. The histological changes are also described. With lack of iron the first symptom is a slight and rather uniform chlorosis, later becoming pale yellow and in severe cases white, and the affected tissues are curved strongly upward. The previously developed leaves remain a normal green. With lack of manganese the upper leaves become light green to chlorotic and later develop brown, necrotic patches along the veins, while the tuber formation is checked.

An excess of manganese causes the formation of small necrotic spots in the interveinal tissues, beginning in the lower leaves; and in severe cases necrotic streaks and patches develop also on the veins and petioles and even on the stem. With the higher concentrations growth is checked and the plants die prematurely. With a considerable excess of copper the plants develop a burned

appearance and later fall. With somewhat lower concentration the petioles break at the base, and some necrosis develops on the under side of the blade and mostly near the point, followed by a downward curling. An excess of coarse salt induces the development of a chlorotic band along the margins of the lower leaves, followed by necrotic patches and final death of the margins, which may curl either upward or downward. Growth is checked, and the plants finally become stiff. The roots and tubers appear normal.

The decrease in the susceptibility of some races of potatoes to certain virus diseases [trans. title], J. OORTWIJN-BOTJES (*Landbouwk. Tijdschr. [Amsterdam]*, *47 (1935), No. 579, pp. 651–657, figs. 2*).—Top necrosis, crinkle, leaf roll, and mosaic diseases are considered in this study.

A top-necrosis virus found in some apparently "healthy" potatoes, T. P. DYKSTRA (*Phytopathology, 25 (1935), No. 12, pp. 1115, 1116*).—The virus component B was secured free from the virus X by grafting scions of the English variety Up-to-Date containing X and B on a potato seedling immune to the X virus. The B virus alone produces typical top necrosis on Arran Victory. Evidence was secured that apparently healthy tubers of some American varieties contain a component in addition to virus X. This component, believed to be the same as the Bawden virus B, caused a top necrosis on the English varieties President and Arran Victory, but failed to produce symptoms on any of the American varieties tested.—(*Courtesy Biol. Abs.*)

Alternaria attack in potatoes [trans. title], W. B. L. VERHOEVEN (*Landbouwk. Tijdschr. [Amsterdam], 47 (1935), No. 579, pp. 657–664, fig. 1*).—This is a discussion of the disease due to *A. solani*, with data on the amount and type of injury encountered.

Growth, chemical composition, and efficiency of normal and mosaic potato plants in the field, W. E. STONE (*Jour. Agr. Res. [U. S.], 52 (1936), No. 4, pp. 295–309, figs. 8*).—In studies by the Vermont Experiment Station, using normal and mosaic potato plants grown under field conditions, daily leaf-area and plant-height measurements showed decreased leaf area and slower growth in the diseased plants. Leaflets of the latter grew more slowly and over a shorter period and lacked the early period of rapid growth as compared with the normal leaflets. On a unit-area basis the green weight of normal leaves was greater, but the mosaic plants had a higher dry weight. Chemical analyses of the same measured plants showed a lower ash content in the normal than in mosaic plants. Mosaic reduced markedly the efficiency of a unit area of foliage exposed, as indicated by the amount of CO_2 fixed in the body of the plant as carbon or stored as starch.

Determination of the degree of attack by potato scab in relation to the examination of different potato varieties for susceptibility to scab [trans. title], J. D. KOESLAG (*Landbouwk. Tijdschr. [Amsterdam], 47 (1935), No. 579, pp. 621–635, figs. 6*).—These studies were conducted on over 50 races of potatoes.

The scab problem considered from the mycological side, H. L. G. DE BRUYN (*Landbouwk. Tijdschr. [Amsterdam], 47 (1935), No. 579, pp. 635–643, figs. 5; Eng. abs., p. 642*).—The author's experiments confirmed the results published by others in that different isolations of the *Actinomyces* of potato scab caused different types of scab when inoculated into the potato variety Bintje. One strain causing severe scab was grown in a synthetic solution which in each test was mixed with the sap of a different potato variety. In these tests the pH of the solution changed with the degree of maturity of the tubers furnishing the sap and parallel with the degree of growth of the *Actinomyces*. The best growth was in the solution containing the sap of the susceptible Bintje, while almost no growth occurred in that containing the sap of the

resistant Alpha variety. This confirms the existence of a physiological scab resistance.

Phytophthora rot of sugar beet, C. M. TOMPKINS, B. L. RICHARDS, C. M. TUCKER, and M. W. GARDNER (*Jour. Agr. Res. [U. S.], 52 (1936), No. 3, pp. 205-216, pl. 1, figs. 3*).—As a result of cooperative investigations between the U. S. D. A. Bureau of Plant Industry and the Utah, Missouri, and California Experiment Stations, this sugar beet rot has been found in Utah, Idaho, Colorado, and California in poorly drained soils or areas where irrigation water has accumulated. Infection is favored by excessively wet soil. Yield and sugar content are greatly reduced.

The basal end of the taproot is usually rotted, although infection may occur along the side of the taproot, especially where rootlets are attached. In the field the disease causes leaf wilting during the day and ultimate death of the plant. In the early stages the infected root tissues seen on the cut surface are water-soaked and light brown, with a thin, blackish-brown zone at the advancing face of the lesion. Later the parenchyma tissues may disintegrate and leave a tuft of fibers at the tip of the root.

The disease is caused by *P. drechsleri*, of which a description is given. The fungus grows at from 8° to 35° C., with its optimum at from 28° to 31°. It grows well throughout a wide pH range.

With mycelium as inoculum, infection was readily obtained on both wounded and unwounded roots of plants in the field and also on harvested roots in the laboratory. The fungus caused damping-off of sugar beet seedlings grown in inoculated soil at laboratory temperatures. In the laboratory, wound inoculations with mycelium were successful on roots of garden beet, carrot, turnip, and parsnip, on potato tubers, and on apples, summer squash fruits, green peppers, and green tomatoes. Inoculations without wounds were successful on eggplant fruits, green peppers, ripe tomatoes, and summer squash fruits, but not on apples or green tomatoes.

A study of coalescing haploid pustules in Puccinia helianthi, A. M. BROWN (*Phytopathology, 25 (1935), No. 12, pp. 1085–1090, figs. 2*).—On sunflower leaves 288 pairs of monosporidial pustules of *P. helianthi* were obtained. The two components of each pair were at first from 2 to 4 mm apart. To prevent the interflow of their pycnial nectar when later each pair would unite to form a compound pustule, a barrier of the Eastman Opaque No. 1 was placed between the two components of each pair. The plants bearing the pustules were protected from insects. Of the 288 compound pustules that formed subsequently, 110 produced aecia. Almost invariably aecia developed first in one component of a compound pustule and afterward in the other. The evidence indicates that in a compound pustule of *P. helianthi* two haploid components of opposite sex can diploidize each other by means of hyphal fusions, and without the intervention of their pycnospores.—(*Courtesy Biol. Abs.*)

The importance of breeding timothy for rust resistance [trans. title], E. RĂDULESCU (*Züchter, 7 (1935), No. 12, pp. 324–326, figs. 2*).—Data are presented for the 1933–34 seasons relative to the incidence of rust on timothy (*Phleum praiense*). Since the incidence was high, the effects of the disease on growth and yield were peculiarly susceptible to observation, and apparently resistant clones and strains were selected and further tested (1934–35). From the information obtained, it appears that rust epidemics can cause great damage to timothy, whether in fields or pastures, in mixed or pure stands, and whether grown for fodder or for grain. The importance of breeding for resistance is therefore stressed. Such work presents no serious difficulties, since there are already at hand complex *Phleum* populations among which rust-resistant clones, at the same time possessing the other desired characters, may be found.

Tobacco diseases (*Georgia Coastal Plain Sta. Bul. 25* [*1935*], *pp. 103–107, fig. 1*).—Observations are given on tobacco diseases in the State (1934) and progress reports on tests with crop rotation and cultivation practices in relation to root knot and on studies of downy mildew (blue mold), with suggestions for its control.

Studies on frenching of tobacco, E. L. SPENCER (*Phytopathology, 25* (*1935*), *No. 12, pp. 1067–1084, figs. 3*).—Frenching developed in only 7 of the 19 species of *Nicotiana* tested. Of 10 other solanaceous species tested, only *Petunia hybrida, Datura stramonium*, and tomato were affected. Of the 16 nonsolanaceous species tested, none produced chlorosis characteristic of frenching.

The disease was controlled in the greenhouse by soil composting, by the addition of peat moss, by repeated applications of a nitrogenous fertilizer, and by several aplications of a dilute solution of $CuSO_4$ or $Al_2(SO_4)_3$.

No association of frenching with any pathogenic organism or any mineral deficiency was found. It was produced in tobacco plants grown in sand by the addition, at daily intervals, of an aqueous extract of toxic field soil or by adding as little as 1 part of field soil to 2,000 parts of sand. The experimental evidence presented indicates that frenching is probably not a mineral deficiency disease, but rather a disease produced by some toxic principle, present in certain soils, that exerts its action only under definite environmental conditions.

Behavior of the ordinary tobacco mosaic virus in the soil, I. A. HOGGAN and J. JOHNSON (*Jour. Agr. Res.* [*U. S.*], *52* (*1936*), *No. 4, pp. 271–294*).—Greenhouse and laboratory experiments were conducted by the Wisconsin Experiment Station in cooperation with the U. S. D. A. Bureau of Plant Industry to determine the relative importance of various factors to the persistence or inactivation of Tobacco Virus 1 in the soil. Since the virus leached out readily into the soil, the experiments were performed chiefly with virus extracts added directly to representative soils from the different tobacco districts of the United States.

In certain soils immediate inactivation of an appreciable amount of the added virus occurred, but in no case to the high degree attained with such highly adsorptive substances as charcoal. This limited inactivation was apparently not correlated with the physical character of the soil in the presence of moisture, but desiccation of the soil resulted in an immediate, and usually complete, inactivation. The rate and degree of inactivation during drying was correlated to a considerable degree with the soil character and is possibly related to adsorption phenomena. Neither the degree of water saturation above a low minimum nor the natural pH range in soils appeared to affect the inactivation, but aeration evidently increased its rate slowly both directly and through its effect on microbial activity. Soil temperatures of from 5° to 30° C. did not appreciably affect the rate, but at 40° it was definitely increased. Freezing of the soil caused rapid inactivation regardless of the actual temperature, probably through the freezing out of the soil moisture, but neither freezing nor desiccation caused appreciable inactivation of the virus in undecayed plant tissues in moist soil. On the other hand, desiccation of badly decayed tissues caused rapid inactivation. Exposure of moist plant tissues to decay in the presence or absence of soil resulted in a gradual loss of the virus content. Though the rate of this decay was naturally affected by temperature, moisture, etc., considerable amounts of active virus remained after 8 mo. of exposure in the soil out of doors. Above freezing temperatures, virus extracts persisted in moist, poorly aerated soil for 1 yr. or more, but the rate of inactivation was definitely more rapid in some soils than in others, being strikingly more rapid (causes unknown) in pure sand than in field soils.

It is believed that the data presented should have a considerable bearing on studies and observations on the overwintering of this virus in the field and on the planning of field experiments relative to control measures.

Water soaking of leaves in relation to development of the wildfire disease of tobacco, E. E. CLAYTON (*Jour. Agr. Res.* [*U. S.*], *52* (*1936*), *No. 4, pp. 239–269, figs. 9*).—Artificial inoculations with *Bacterium tabacum* [*Phytomonas tabaci*] have previously produced only small lesions surrounded by a halo. In the field, destructive wildfire epidemics are characterized by large, quick-forming lesions, with little or no halo. These latter have been confused with certain supposedly nonparasitic spots. In consequence, studies were undertaken to determine the conditions necessary for the development of epidemic wildfire, and the essential factor was found to be a water soaking of the leaves, which occurs extensively only during the most severe rain and windstorms. Without water soaking, about a week was required for the full development of small halo lesions, but with water soaking large lesions were produced in 48 hr. Water soaking facilitated the spread of the bacteria through affected tissues, and a persistence of these areas for 24 hr. or more after inoculation was required for the maximum disease development.

Low topping and high-nitrogen or low-potash fertilization favored disease development by increasing the leaf susceptibility to water soaking. Similarly, on the same plant, ease of water soaking and severity of disease damage were greater with injured leaves, with leaves turned up so as to expose the lower surface, and with the basal, more mature leaves.

It is concluded that types of tobacco grown in the United States are normally very resistant to invasion, that destructive epidemics occur only when this normal resistance has been broken down by water soaking, and that cultural and fertilization practices have a marked, but indirect, effect on host susceptibility.

Histological study of tissues from greenhouse tomatoes affected by blotchy ripening, H. L. SEATON and G. F. GRAY (*Jour. Agr. Res.* [*U. S.*], *52* (*1936*), *No. 3, pp. 217–224, pls. 9*).—Blotchy ripening of greenhouse tomatoes (*Lycopersicon esculentum*) in late spring and early summer, studied at the Michigan Experiment Station, is characterized by failure of areas of the outer fruit wall to develop and color normally. As maturity approaches, these areas remain hard and green, the vascular bundles beneath the blotches appear brown and necrotic, and in severe cases cavities may develop adjacent to the bundles. The vascular system of normal fruit walls consists of large carpellary bundles, their branches, and anastomosing veins. The outer fruit walls are made up of the outer epidermis, the fleshy layer of large parenchyma cells, and the inner epidermis. The bundles are bicollateral, dissected with vascular rays of parenchyma, and with spirally thickened tracheae. Histological studies of the pericarp indicated that the discolored tissues in the blotchy areas invariably involve parenchyma of the fleshy layer and that the bundles are not involved. Bands of discolored cellular material appear between the epidermis and the bundles which, viewed through the epidermis, produce the impression that the bundles are affected. The cavities in the blotchy areas result from a collapse of the parenchyma originally occupying these areas. The break-down of the parenchymatous cells near and adjacent to the bundles in the blotchy areas severs the connections of the outlying cells for the transfer of elaborated materials and water, and normal ripening is thus prevented.

These observations substantiate the hypothesis that blotchy ripening is due primarily to conditions resulting from withdrawal of water from the fruits during periods of excessive transpiration occurring from 2 to 5 days before the fruits ripen.

The control of chlorosis of fruit trees by the internal administration of iron salts [trans. title], N. VAN POETEREN (*Tijdschr. Plantenziekten, 41 (1935), No. 11, pp. 315, 316; 12, p. 330*).—This is a note on the method of introducing citrate of iron into the trees (apple, pear, and plum), with tables showing the diameters of the trees, the diameters and depths of the holes, the numbers of holes per tree, and the dosages of the iron salt per hole and per tree as carried out by the author.

Effect of crown gall, hairy root, and woolly aphids on apple trees in the orchard, C. D. SHERBAKOFF and J. A. MCCLINTOCK (*Phytopathology, 25 (1935), No. 12, pp. 1099–1103*).—From this study at the West Tennessee Substation of the Tennessee Experiment Station, the data obtained in a test orchard of 1,200 trees of 13 apple varieties set out in 1923 near Jackson showed the death rate to be about proportional to the development on them at planting time of woolly aphid [*Eriosoma lanigera*] knots, crown gall [*Phytomonas* (*Bacterium*) *tumefaciens*], and, apparently, hairy root [*P.* (*Bacterium*) *rhizogenes*], and that, therefore, under these conditions it is unsafe to plant trees thus affected.—(*Courtesy Biol. Abs.*)

An apple canker caused by Monochaetia mali, J. W. ROBERTS (*Phytopathology, 25 (1935), No. 12, pp. 1116, 1117, fig. 1*).—The etiological relationship of this fungus to an apple canker was demonstrated by successful inoculations and re-isolations. Since this canker is apparently uncommon, it cannot be considered a serious disease.

Comparison of several materials for apple scab control in 1935, L. R. FABISCH and W. C. DUTTON (*Michigan Sta. Quart. Bul., 18 (1936), No. 3, pp. 155–159*).—From tests with lime-sulfur, flotation sulfur, and "Electric" sulfur, it is indicated that under the 1935 conditions in Michigan the last two preparations at any concentration are nearly always safer as regards spray injury than the higher concentrations of lime-sulfur. They will also undoubtedly give satisfactory control of scab with as little as 6 lb. to 100 gal. of spray, provided that spraying is started before spore discharge and applications are thorough and frequent enough. Failure to prevent primary infections early in the season will be followed by serious complications later. Certain variations in the spray schedule are discussed.

Peach diseases and their control in Tennessee, C. D. SHERBAKOFF and J. O. ANDES (*Tennessee Sta. Bul. 157 (1936), pp. 11, figs. 3*).—This is a general treatise on the more important diseases and insect pests of peaches in the State (including brown rot, scab, bacterial leaf spot, leaf curl, scale insects, plum curculio, oriental fruit moth, and borers) and a report of local tests for their control. The results obtained led to the conclusion that a dormant spray for leaf curl and scale is always necessary, to be followed, under ordinary conditions, by four summer sprays. Under special conditions other applications must be added to the above schedule. Sulfur should be applied early in the season for peach scab. Either flotation sulfur or wettable sulfur may be used satisfactorily to replace the dry mix. Barium fluosilicate is compatible with flotation sulfur for spraying peaches, but not with dry mix where lime is used. The use of a combination of 4 lb. each of zinc sulfate and hydrated lime to 50 gal., when lead arsenate is added, will materially decrease injury from lead arsenate and defoliation by leaf spot bacteria and will maintain a good condition of the foliage. When zinc sulfate is used, at least an equal weight of good hydrated lime must be included.

Preventing peach canker, R. S. WILLISON and G. C. CHAMBERLAIN (*Canada Dept. Agr. Circ. 92 (1935), pp. 8, figs. 4*).—The peach canker in Ontario is due to *Valsa cincta*, which usually infects the tree in the fall and winter through wounds and dead areas. This circular gives a general discussion of the rela-

tions of pruning, injuries, cultivation, and brown rot to the canker. A number of disinfectants tried either gave indifferent results or were toxic to the wood, but it is believed that the pruning and cultivation practices discussed would considerably reduce the prevalence of the disease.

Peach mosaic disease in Colorado, E. W. BODINE (*Colorado Sta. Bul. 421 (1936), pp. 11, figs. 10*).—The symptoms shown by the leaves, twigs, and fruit, and by the tree as a whole are described. Trees of all ages and varieties are apparently susceptible, but some varieties show more pronounced symptoms than others. The means of transmission are unknown, but the spread of the disease is very rapid. On general principles, frequent inspection and destruction of all diseased trees are measures suggested for control.

Brown rot of fruits and associated diseases of deciduous fruit trees.—II, The apothecia of the causal organisms, T. H. HARRISON (*Roy. Soc. N. S. Wales, Jour. and Proc., 68 (1934), pt. 2, pp. 154–176, pl. 1, figs. 11*).—Continuing this series (E. S. R., 74, p. 505), a comprehensive account is given of the apothecia of *Sclerotinia fructigena, S. laxa,* and *S. fructicola.* An additional record of *S. fructigena* found at Bologna in 1919 is presented, and the record from Denmark is discarded. The occurrence of apothecia of a brown rot fungus in the Caucasus is discussed.

The records of [R.] Aderhold and [W.] Ruhland (1905) of *S. laxa* and of Wormald (E. S. R., 47, p. 546) of *S. cinerea* are reviewed as two excellent descriptions of the fungus for which the name *S. laxa* is preferred by the author. The occurrence of apothecia of *S. laxa* in England in 1932 is recorded. Existing records of *S. fructicola* are briefly reviewed and supplemented by the author's observations in Australia. The apothecia of *S. laxa* and *S. fructicola* appear to be morphologically inseparable, and attempts to separate them by stipe studies are not yet completed. It is believed, however, that the striking differences between the two species in the imperfect stage justify their separation.

The role of intracellular mycelium in systemic infections of Rubus with the orange-rust, S. M. PADY (*Mycologia, 27 (1935), No. 6, pp. 618–637, figs. 42*).—"Basidiospores of the two short-cycled strains of the orange rust, *Gymnoconia interstitialis,* when sown on young shoots of *Rubus,* penetrate the epidermis and form a typical penetration hypha. From this hypha intracellular branches arise which enter adjacent cells passing through the side walls of the host cell. As the hypha enters the next cell, it cuts off a tip cell. The subterminal cell gives rise to a branch called the primary runner. The terminal cell divides again, and this subterminal cell also gives rise to a runner called the secondary runner. This cell is much enlarged with a characteristic rounded base. The terminal cell continues to grow, becoming more or less compactly coiled and multicellular. The runners enter neighboring cells, and each repeats this procedure. The result is a highly characteristic intracellular mycelium. The mycelium grows in this way through the cortex into the vascular bundles and into the pith. From the tenth day onward and continuing throughout the season, strands of intercellular mycelium begin to appear in the phloem. These arise from one of the runners, usually the primary runner, which grows into the middle lamella and the intercellular spaces. The intercellular mycelium grows rapidly in the phloem and becomes established as a perennial mycelium in the cane and in the roots.

"The function of the intracellular mycelium seems to be that of establishing the fungus in the host and is probably haustorial in nature. Little, if any, growth of the intracellular mycelium takes place the following spring, and the evidence indicates that degeneration takes place later."

Raspberry virus disease control, H. F. WINTER and H. C. YOUNG (*Ohio Sta. Bimo. Bul. 179 (1936), pp. 54–58*).—The authors' attempts to produce raspberry stock free of virus diseases have covered a period of 10 yr., during which time a large amount of stock containing not over 1.25 percent of diseased plants has been produced and distributed. During the course of this work it was found essential to isolate new plantings from disease sources. Records over a 7-yr. period indicated that the virus incidence increases as plantings become older. Thus propagating stock should come from young plantings.

The control recommendations are to use healthy stock, isolate new plantings from virus-disease sources, and to inspect and rogue the plantings several times each season.

The "degeneration" of the strawberry, I–IV (*Imp. Bur. Fruit Prod. [East Malling, Kent], Tech. Commun. 5 (1934), pp. 28*).—In the foreword, by B. T. P. Barker, it is stated that "the following technical communication on strawberry degeneration, with its comprehensive survey of the researches on these problems, will be found valuable to all interested in the subject. . . . In its compilation the cooperation of pathologists has been enlisted." The following subdivisions of the general subject are included, and bibliographies appear at the end of each:

I. *The pomological aspect of strawberry degeneration*, by D. Akenhead (pp. 4–10).—The discussion here covers varieties, strains, runners, fertility and sterility, climate, cultivation, waterlogging, mechanical damage, and manuring.

II. *Virus as one cause of strawberry degeneration*, by R. V. Harris (pp. 11–15).—Following an introductory section, the author discusses the American and European literature on the subject.

III. *The phenomenon of root rots in connection with strawberry degeneration*, by G. H. Berkeley (pp. 16–19).—The literature review presented led to the conclusion "that 'root rot' may be found to play a considerable role in the deterioration of strawberries in England, as it has been shown to do in parts of Canada and U. S. A."

IV. *The insects and other animals associated with degeneration of the strawberry*, by A. M. Massee (pp. 20–28).—Following an introduction, this section reviews present knowledge on eelworms, insects, and mites as possible causes of degeneration in strawberries and their control and on the association of insects and mites with virus diseases of this host.

Court-noué, a parasitic disease of the vine [trans. title], P. VIALA and P. MARSAIS (*Compt. Rend. Acad. Sci. [Paris], 198 (1934), No. 1, pp. 26–29*).—This preliminary note (see below) describes the fungus *Pumilus medullae* n. sp. (Sphaerioideae of Saccardo, and related to *Piptostomum*) as the cause of the court-noué disease of grapevines.

Court-noué (Pumilus medullae spec. nov.), P. VIALA and P. MARSAIS (*Ann. Inst. Natl. Agron., 27 (1935), pp. 7–116, pl. 1, figs. 80*).—This monograph on court-noué of grapevines discusses comprehensively the history and distribution of the disease; the symptoms, including the morbid anatomy of the lesions; *P. medullae*, the fungus believed to be the cause (see above), its parasitic and saprophytic relations, its cultural characters and cultural races, the toxic residues from its cultures, its morphology and life history (mycelium, conidia, pycnidia, spermagonia, sclerotia, and perithecia); and treatments for the control of the disease. Some of the replies to a general questionnaire on the court-noué problem sent to grape growers are included, and a five-page bibliography concludes the work.

Some field experiments for the control of melanose and stem-end rot of citrus, W. A. KUNTZ and G. D. RUEHLE (*Fla. State Hort. Soc. Proc., 48 (1935), pp. 79–83*).—As a result of experiments in Florida (1933–34), conducted in part

at the Citrus Substation, the authors are convinced that properly carried out spraying is superior to pruning alone for melanose control. but that in the older groves spraying alone (one application) will not give the maximum control. In the latter case more treatments, or both spraying and pruning, should be practiced. Observations indicated that large applications of bordeaux mixture may injure the trees. The sulfur materials used were less effective than the copper sprays in controlling melanose fruit blemishes.

There was a lessening of stem-end rot after spraying with bordeaux mixture.

Spraying for the control of citrus scab, G. D. RUEHLE (*Fla. State Hort. Soc. Proc., 48 (1935), pp. 84–89*).—These studies (1932–34) from the Citrus Substation of the Florida Experiment Station indicate that in most cases citrus scab can be controlled effectively and economically by spraying. The copper sprays consistently gave better control than the sulfur and mercury fungicides, and of the copper sprays tested home-made bordeaux mixture appeared to be the most reliable and effective. If severe infection is to be expected, two applications are advised—the first (3–3–50) to be given just before the spring growth starts and the second (1.5–1.5–50) during the last of the blooming period—preferably with a suitable spreader added to each. These treatments should be followed in June by an oil emulsion for control of scale.

The control of red rust in tea plantings [trans. title], J. K. DE JONG (*Indische Mercuur, 58 (1935), No. 51, pp. 785, 786*).—This article presents notes on the control of red rust of tea due to the alga *Cephaleuros parasitious*.

A bacterial disease of begonia [trans. title], K. T. WIERINGA (*Tijdschr. Plantenziekten, 41 (1935), No. 11, pp. 309–313, pl. 1*).—This paper discusses a primarily vascular disease of begonia shown to be due to a nonmotile rod here described as *Phytomonas flava begoniae* n. sp. The cultural characters of the latter are given, and a plate culture (yellow colony) and the stem and leaf symptoms are both described and illustrated.

Relative susceptibility of some annual ornamentals to root-knot, C. C. GOFF (*Florida Sta. Bul. 291 (1936), pp. 15, figs. 2*).—Of 80 species of ornamentals in experimental plantings on heavily infested soil, 7 are listed as having remained uninfested, while 19 became very lightly infested, 16 lightly, 12 moderately, 13 heavily, and 13 very heavily infested.

Nectria canker of trees, D. S. WELCH (*Natl. Shade Tree Conf. Proc., 11 (1935), pp. 73–76*).—This contribution from Cornell University gives a general discussion of tree cankers, and more particularly of a new type of canker disease recently attracting considerable attention in northeastern North America. So far as known, it affects only beech trees and is due to the combined activities of the woolly beech scale (*Cryptococcus fagi*) and the fungus *Nectria* sp.

The Siberian elm (Ulmus pumila): Its importance in the control of Ceratostomella (Graphium) ulmi [trans. title], L. P. PASSAVALLI (*Alpe [Firenze], 22 (1935), No. 11–12, pp. 409–418, figs. 6*).—This article deals with the importance of the introduction of the dwarf Asiatic elm into Europe, and particularly into Italy, as a species resistant to the Dutch elm disease. The present distribution of the species in Italy is discussed.

Dates of production of the different spore stages of Cronartium ribicola in the Pacific Northwest, J. L. MIELKE and J. W. KIMMEY (*Phytopathology, 25 (1935), No. 12, pp. 1104–1108, fig. 1*).—Data collected annually in western North America from 1922 to 1934, inclusive, showed a considerable seasonal variation in the dates of occurrence of various spore stages of *C. ribicola* on *Pinus monticola*, *P. albicaulis*, and *Ribes* spp. Altitude is a factor which apparently affects the advent of the spores on the different hosts.—(*Courtesy Biol. Abs.*)

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Notes on economic insects and their control] (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 214–219*).—Brief contributions here presented (E. S. R., 74, p. 512) are as follows: Correct Name for the Mexican Bean Beetle, by E. A. Chapin (p. 214); Toxicity of Dextro and Levo-alpha-para-tolylpyrrolidine to *Aphis rumicis* L., by D. Starr and C. Richardson (pp. 214, 215); An Outbreak of the Gooseberry Fruitworm and Its Control With Powdered Derris and Cubé Root, by O. H. Hammer (pp. 215, 216), contributed by the New York State Experiment Station; Injection Method for Dispersion of Oil Into Tank Mixtures, by M. D. Farrar and W. P. Flint (p. 216); Longevity of Adults of Elm Leaf Beetle, by T. H. Jones (p. 217); Elm Bark Beetles in New York State and *Scolytus sulcatus* Lec. on Apple in New York State, both by H. Dietrich (p. 217); Comparative Toxicity of Dust Mixtures Containing Derris and Cubé to the Tobacco Flea Beetle Under Cage Conditions, by F. S. Chamberlin (pp. 217, 218); Disease Checks Bertha Army Worms, by J. A. Munro (p. 218), contributed from the North Dakota Experiment Station; and Dinitro-ortho-cyclohexylphenol Offers Promise in Control of Citrus Red Mite, by A. Boyce and D. T. Prendergast (pp. 218, 219), contributed from the California Citrus Experiment station.

[Report of work in entomology by the Colorado Station] (*Colorado Sta. Rpt. 1935, pp. 19–23*).—Brief reference is made (E. S. R., 72, p. 806) to findings as to nonpoisonous insecticides, control of the tomato psyllid, miscellaneous important insects of the year, and grasshopper control.

[Report of work with insects by the Nebraska Station] (*Nebraska Sta. Rpt. [1935], pp. 21–23*).—The work of the year reported (E. S. R., 73, p. 637) relates to the chinch bug and hessian fly; grasshopper control; Nebraska cutworms, a bulletin relating to which has been noted (E. S. R., 74, p. 374); control of potato flea beetles and potato psyllids; and a brood study of the codling moth in southeastern Nebraska.

Further studies of the use of radio waves in insect control, T. J. Headlee and D. M. Jobbins (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 181–187, fig. 1*).—This contribution from the New Jersey Experiment Stations (E. S. R., 71, p. 665), reporting further upon the use of radio waves in insect control, is presented with a list of 27 references to the literature.

Measures other than spraying for the control of orchard insect pests, D. L. Van Dine (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 37–43*).—This is a practical discussion, in which measures other than spraying of value in combating orchard insects are considered.

Factors concerned in the deposit of sprays.—II, Effect of electrostatic charge upon the deposit of lead arsenate, W. M. Hoskins and E. L. Wampler (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 134–143, figs. 4*).—In this further contribution (E. S. R., 74, p. 515) "a microcataphoresis cell for the determination of the electrostatic charge of suspensions is described and figured. Suspensions of acid lead arsenate in water have a negative charge. Very low concentrations of polyvalent positive ions, e. g., Al^{+++}, decrease this charge, and higher concentrations give a strong positive charge to the suspension. Beeswax suspensions act similarly to lead arsenate. Solutions containing aluminum ion in the concentration range which gives little or no charge to particles of wax in suspension wet a surface of the same kind of wax. The deposit of lead arsenate varies with the concentration of aluminum present. It is increased by concentrations which give a low positive charge to the lead arsenate and leave a negative charge on the wax surface, but it is greatly diminished when both the lead arsenate and the wax are positively charged.

The effect of wetting agents upon this effect is dependent upon the amount used."

Ovicidal and scalicidal properties of solutions of dinitro-o-cyclohexylphenol in petroleum oil, J. F. KAGY and C. H. RICHARDSON (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 52–61, figs. 2*).—The toxicity of solutions of dinitro-o-cyclohexylphenol in petroleum oil as determined in the laboratory for the San Jose scale and eggs of *Lygaeus kalmii* is reported upon. A method for comparing the toxicity of substances to the *Lygaeus* eggs is described. In this method the embryonic and postembryonic mortalities were pooled to furnish a measure of the total effectiveness of the ovicide. A method for comparing the toxicity of substances to San Jose scale is reviewed, a brief account being given of the design and technic. In the work lethal concentrations were established with respect to the amount of dinitro compound dissolved in the oil phase of the emulsions and the concentrations of oil plus the compound in the diluted sprays. The toxicities of the mixtures for eggs and scale are represented by curves.

The authors have found that because of the high toxicity of the dinitro compound only a relatively small concentration of oil is necessary to carry an effective concentration of it. The use of the mixture for the control of insects during the dormant period is indicated.

A list is given of 17 references to the literature cited.

Orchard trials of dinitro-o-cyclohexylphenol in petroleum oil for control of rosy apple aphis and San Jose scale, W. C. DUTTON (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 62–65, fig. 1*).—Orchard trials made by the Michigan Experiment Station in conjunction with the laboratory studies of Kagy and Richardson above noted are here reported.

"The data from orchard trials in 1935 indicate high efficiency for the dinitro-o-cyclohexylphenol in petroleum oil against the eggs of the rosy apple aphid and the black cherry aphid. Concentrations of oil and toxicant that are effective against aphid eggs seem also to be entirely satisfactory for the control of the San Jose scale. Less extensive trials indicate that the black cherry aphid can be controlled with as low, or possibly lower, concentrations than are necessary for rosy aphid control.

"Dilute sprays containing from 1.2 percent oil and 0.05 percent DNOCHP to 2.4 percent oil and 0.1 percent DNOCHP are undoubtedly adequate to give satisfactory control of the rosy apple aphid, the black cherry aphid, and San Jose scale, and without danger of injury to trees."

Naphthalene as a greenhouse fumigant, W. D. WHITCOMB (*Massachusetts Sta. Bul. 326 (1935), pp. 31, pls. 4, fig. 1*).—This contribution has been prepared with a view to supplying specific information on the conditions under which greenhouse fumigation with naphthalene is both safe and effective. It has been found that commercial flake naphthalene, costing from 8 to 12 ct. a pound, when vaporized in the greenhouse controls the common red spider and the greenhouse thrips very effectively and is a satisfactory method for combating pests not controlled by nicotine or by hydrocyanic acid gas. Naphthalene fumes kill by penetrating the respiratory system of insects and spiders, causing paralysis and death.

Eggs of the red spider were killed by two or more successive fumigations using 3 oz. of naphthalene per 1,000 cu. ft. for 6 hr., and old eggs were killed more quickly than newly laid eggs. The larva, protonymph, and adult female of the red spider appear to be more easily killed than other stages. Two successive fumigations at a dosage of 2 oz. or more of naphthalene per 1,000 cu. ft. have resulted in practically perfect control of red spider under favorable

experimental conditions. Dosages of more than 3 oz. of naphthalene per 1,000 cu. ft. have frequently caused supersaturation and plant injury, and dosages of less than 2 oz. per 1,000 cu. ft. have usually required more than two successive treatments to be effective. In controlled experiments the vaporization and confinement of 0.75 oz. of naphthalene per 1,000 cu. ft. produce a noticeable effect on the red spider, and an exposure to this concentration for 3 hr. has killed 85 percent or more of these pests. Under average greenhouse conditions some of the fumes escape or are absorbed by the soil and benches, so that the most satisfactory dosage is from 2 to 3 oz. per 1,000 cu. ft., and a total exposure of 6 hr. is recommended for effective results.

Greenhouse thrips and onion thrips are readily killed by naphthalene fumigation. The most common species of aphids and the adults of the greenhouse white fly are also killed but not as effectively as with nicotine fumes or hydrocyanic acid gas. Mealybugs are only partially controlled. Cyclamen mite is quite resistant to naphthalene fumigation, but the broad mite, a closely related species, is well controlled. Bulb mites and soil inhabiting pests are killed when exposed but because of their habits are seldom controlled. Leaf roller and leaf tier moths are killed by strong fumigations, but the larvae are more resistant.

Comparison of criteria of susceptibility in the response of Drosophila to hydrocyanic acid gas.—II, Recovery time, B. M. BROADBENT and C. I. BLISS (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 143–155, figs. 4*).—In this further contribution (E. S. R., 74, p. 523), the time of recovery from paralysis due to fumigation with hydrocyanic acid gas has been compared with other toxicological indexes in the adult pomace fly.

The experimental analysis of the growth of an insect population, D. S. MACLAGAN and E. DUNN (*Roy. Soc. Edinb. Proc., 55 (1934–35), No. 2, pp. 126–139, figs. 5*).—In this contribution, following a brief introduction, the authors consider the life history; technic; and the effect of density upon the frequency of copulation, upon rate of oviposition, and upon utilization of medium for oviposition. A mathematical analysis of the data follows.

Occurrence of Aphis medicaginis Koch and Anomis flava fimbriago Steph. on cotton in South Carolina, C. F. RAINWATER (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 94–96*).—The cowpea aphid is reported to have been present in injurious numbers on seedling cotton in South Carolina during the spring of 1934. "It made its appearance before much of the cotton was chopped, and the injury caused by it was especially noticeable between the chopping period and the appearance of the first squares. The attack was centralized in the terminal buds and on the small leaflets and petioles. It was very seldom found on the larger leaves, differing in this respect from the cotton aphid, *Aphis gossypii* Glov. . . .

"The observations made in 1934 prove conclusively that *A. medicaginis* is at times an important insect pest of cotton. It was widely distributed over the eastern part of South Carolina in the spring of that year, some injury being observed in each of the following counties: Florence, Darlington, Marion, Williamsburg, Dorchester, Charleston, Beaufort, and Colleton."

The larvae of the noctuid moth *Anomis flava fimbriago* Steph. caused some injury to the leaves and occasionally to the squares of cotton during the summer and fall of 1934 in South Carolina. Although it is known to attack a number of Malvaceae, there are few records of its attack on cotton. This is probably due to the fact that its damage is attributed to some other insect, particularly to the cotton leaf worm, and perhaps less frequently to *A. erosa* Hbn. The larvae were found feeding in cotton squares the last week of

August, and pupae were found webbed up in cotton leaves the latter part of September and through October.

Insect and disease evaluations in potato experiments, D. O. WOLFENBARGER (*Jour. Econ. Ent*, *29* (*1936*), *No. 1, pp. 187–189, fig. 1*).—In this contribution "the yield of potatoes is depicted as being influenced by injured leaf surfaces resulting from attacks by leafhopper and flea beetle insects and from early blight disease. Graphic representation shows that the largest yields of potatoes were obtained from plants showing the fewest leaf injuries. As the number of leaf injuries increased, the yield decreased in a linear relationship. The largest yields tended to come from those plant treatments which received the most bordeaux mixture. Flea beetle holes were statistically significantly associated with the yield and were not significantly associated with hopper burn and early blight. Hopper burn was significantly associated with early blight."

Termite damage in Connecticut, N. TURNER and M. P. ZAPPE (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 195–198*).—This account of injury caused by *Reticulitermes flavipes* Kollar to buildings in the fall of 1931 and the spring of 1932 is contributed from the Connecticut [New Haven] Experiment Station.

Gryllus domesticus L. and city dumps, E. A. BACK (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 198–202*).—A report is made of house infestations and the injury caused since 1920 by house crickets that have migrated from city refuse dumps.

The "17-year locust" or periodical cicada (Tibicen septendecim) in Michigan for 1936, E. I. MCDANIEL (*Michigan Sta. Quart. Bul., 18 (1936), No. 3, pp. 151–153*).—A brief account is given of the periodical cicada, the adults of which were due to appear in Michigan during May and June 1936. It is pointed out that under forest conditions there is nothing that can be done to control the cicada, but that in orchards a heavy-infested area can be protected to a degree by postponing all pruning operations until late June. Trees 1 to 3 yr. old can be protected by wrapping them in cheesecloth for the period the adults are on wing.

Notes on the control of Anarsia lineatella in California, L. S. JONES (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 156–160*).—The results of spring and summer control experiments with the peach twig borer, conducted in Sutter County, Calif., during the season of 1932, are reported.

"The spring spray of basic lead arsenate appeared to reduce effectively the overwintering population of larvae. The tests of later treatments, undertaken because of the possibility that increases in summer populations should be checked, gave less positive results." The June spray of basic lead arsenate against the first summer brood of larvae was the most effective summer treatment. The value of late sprays during the years when large populations of borers are present cannot be predicted on the basis of this preliminary work.

Economic control of Magicicada (Tibicina) septendecim L. in a grove of century-old oaks (Cicadidae—Homoptera), F. W. CRAIG (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 190–192, fig. 1*).—A description is given of the method that was used in preventing injury by the periodical cicada to a grove of valuable old oaks surrounding a hotel at White Sulphur Springs, W. Va. This was accomplished by banding the trees with common fly tanglefoot and collecting and burning the cicadas that massed below the bands.

Two years' field experiments on the control of the cotton flea hopper with several insecticides, K. P. EWING and R. L. MCGARR (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 80–88, figs. 4*).—A report is made of 62 field-plat tests conducted in the vicinity of Port Lavaca, Tex., during the years 1933 and 1934. Infestation records and a count of the squares, blooms, and bolls

on cotton plants in the treated and untreated plats during the progress of the experiments, as well as the final yield of cotton from the various plats, showed that sulfur and a commercial mixture of 75 percent calcium arsenate and 25 percent paris green were effective in controlling the cotton flea hopper. Two preliminary tests made with calcium arsenate in 1934 showed fair results. The field tests showed that sodium fluosilicate was ineffective in controlling this insect.

A field study on the citrus green bug Rhynchocoris serratus Donovan, C. E. GARCIA (*Philippine Jour. Agr., 6 (1935), No. 3, pp. 311–325, pls. 4*).—This is an account of the biology and control of a pentatomid which causes considerable damage to citrus fruits in certain places in the Philippines. It is said to be widely distributed in the islands and also found in British India, the Malay Peninsula, Java, Sumatra, and Borneo.

Differences between resistant and non-resistant red scale in California, W. MOORE (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 65–78, figs. 5*).—A study of the differences in the resistance and nonresistance of California red scale made during the course of an intensive study of fumigation with hydrocyanic acid gas in 1932, 1933, and 1934, a portion of which has been noted (E. S. R., 70, p. 505; 72, p. 363), has led to the following conclusions:

"The concentration to which the resistant red scale in California is exposed is of double the value of the length of exposure in effecting a kill, which relationship may be expressed as a constant which is the product of the concentration multiplied by the square root of the length of exposure. The concentration to which nonresistant red scale in California is exposed is of approximately equal value to the length of exposure in effecting a kill, the lethal constant being the product of the concentration multiplied by the length of exposure to the 0.8 power. Increasing the temperature reduces the kill of resistant scale decidedly but slightly improves the kill of nonresistant scale. Low relative humidities are equally unfavorable and high relative humidities are equally favorable to the kill of resistant and nonresistant red scale. These different relationships of concentration, exposure, and temperature developed as a result of fumigations in a tight fumatorium serve to explain the contradictory results of experiments conducted in a tight fumatorium and in a tent. The different relationships of concentration and exposure in producing a kill apparently is not a characteristic acquired from previous fumigation, since other insects not normally fumigated show the same characteristics when fumigated with hydrocyanic acid and even with other chemicals not normally used as fumigants."

Progress report on the Key West (Florida) fruit fly eradication project, W. NEWELL (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 116–120*).—Several years of observation and biological investigations and 18 mo. of intensive eradication activities with two fruitflies of the genus *Anastrepha*, namely *A. acidusa* and *A. suspensa*, have led to the conclusion that, barring the unforeseen, eradication from Key West is possible without prohibitive cost and at a comparatively early date.

Calomel: A promising insecticide for root maggot control, H. GLASGOW (*Farm Res. [New York State Sta.], 2 (1936), No. 3, pp. 3, 7, 13, figs. 3*).—Reporting further upon root maggot control work (E. S. R., 71, p. 352), the value of calomel in the program is said to have been firmly established. Although no more effective than corrosive sublimate, calomel possesses a number of important advantages. Being practically insoluble, it can be used in much more concentrated doses without danger of injury. Through use of a calomel suspension at the rate of 3 or 4 oz. to 10 gal. of water, it is frequently possible to secure satisfactory control of root maggots with but a single or at most two

applications and a corresponding saving in time and labor. Unlike corrosive sublimate, it can be used at maximum dosages without danger of injury. There are strong indications that liberal applications of corrosive sublimate solutions, which should give perfect control of root maggots on early cabbage and cauliflower and result in no visible or permanent damage, may under some conditions delay the date of harvesting from a few days to even a week and thus result in a much smaller cash return than where calomel is the insecticide used.

Calomel may be used not only as a suspension in water but also as a dust, or it may be applied directly to the seed at the time of planting. When used as a dust, it should be diluted with some inert carrier such as gypsum or hydrated lime. Various dilutions may be used, one containing 4 or 5 percent of calomel being perhaps as satisfactory as any, since it provides ample bulk to insure even distribution of the calomel. It is pointed out that the treatment for maggot control may be greatly simplified as to time and labor by coating the seed heavily with calomel immediately before planting. While such a procedure, if properly carried out, should result in greatly reducing maggot injury without further treatment being required, it must be regarded as a compromise method and even under the most favorable conditions cannot be expected to give as consistently good control as where the calomel suspension or dust is used.

"The seed treatment, in brief, consists in first moistening the seed with a fairly concentrated solution of some cheap gum, such as gum acacia, using approximately 1 oz. of the gum solution to each pound of seed. An excess of dry calomel is then worked up with the gum-moistened seed, any surplus calomel being removed by passing over a fine sieve. Treated in this way the seed should retain from 1.5 to 2 lb. of calomel for each pound of seed, the individual seeds being uniformly coated with a heavy deposit of the powder and approximately twice their original size."

The tendency of calomel to clump when placed in water has been prevented through incorporating it with small amounts of gum acacia before making the final suspension.

The cannibalistic habits of the corn ear worm, G. W. Barber (*U. S. Dept. Agr., Tech. Bul. 499 (1936), pp. 19, figs. 7*).—In studies of the larvae of the corn earworm conducted at Richmond, Va., in 1929 and at Savannah, Ga., from 1930 to 1932, inclusive, its population in ears of corn was found to be limited by the cannibalistic habit. Notwithstanding the large number of eggs that may be deposited by the moths on corn silks, only a single larva survives in each ear. Individuals were reared to adults from all larval instars and from the egg with no other food than their fellow larvae, 1 larva having consumed some 20 fellow larvae of its own size in the several instars through which it passed to complete its growth. This habit protects the corn crop, for if all the larvae that hatch should survive, that is, if the larvae were not cannibals, the entire crop might be devoured. The extent of this cannibalism depends on the character of the husk, as this determines the points of entry of the larvae and the feeding area within the ear. Advantage may be taken of this habit, therefore, by breeding a type of corn ears that will promote cannibalistic feeding. This consists in developing a longer and tighter husk to limit feeding areas, and thus cause larvae to encounter one another more readily.

Experiments for the control of larvae of Heliothis obsoleta Fabr. on western Long Island during 1935, L. A. Carruth (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 205–209, figs. 5*).—As a contribution from the New York State Experiment Station, two experiments with sweet corn conducted in 1935 are reported upon. The first relates to a comparative field test of certain mechanical and insecticidal treatments against the pest and the second to corn grown within a moth-tight enclosure.

The biological possibility of infestation by flight of the pink bollworm moth, L. W. NOBLE (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 78, 79*).—In the course of experiments conducted in cooperation with the Texas Experiment Station fertilized pink bollworm moths were isolated from males and cotton and exposed to temperatures comparable to those in which moths were taken in the upper air at Tlahualilo, Durango, Mexico, in September 1928. After 7 days' isolation female moths were able to begin or resume oviposition of fertile eggs.

Notes on pink bollworm septicemia, G. F. WHITE and L. W. NOBLE (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 122–124*).—The name pink bollworm septicemia is given to a disease first observed among pink bollworms used in rearing parasites in the laboratory at Presidio, Tex., in 1932. The disease was observed only under laboratory conditions and has not been noted in the field. It was found to be caused by a small, actively motile, non-spore-bearing rod that forms gray colonies on agar, to which the name *Bacillus pectinophorae* is given.

Report on cotton leaf-worm investigations in Florida, including temperature and hibernation studies, J. T. CREIGHTON (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 88–94*).—The studies here reported upon tend to substantiate the view that South America is the native home of the cotton leaf worm, and that in the United States annual reinfestation in the cotton States is unquestionably due to spring migratory females. Parasites reared by the author in Florida and never before reported as parasites of cotton leaf worm include *Brachymeria ovata* Say, *Syntomosphyrum esurus* Riley, *Sarcophaga lambens* Wd., *Beskia aelops* Walk., *Megaselia scalaris* Liv., and *Pulecephora* sp.

Notes on the orange worms Argyrotaenia (Tortrix) citrana Fern. and Platynota stultana Wlsm., A. J. BASINGER (*Jour. Econ. Ent., 29 (1935), No. 1, pp. 131–134, figs. 2*).—This contribution from the California Citrus Experiment Station presents data on the relative abundance in southern California of the orange tortrix and *P. stultana* and on the effect of injury to young oranges caused by their newly hatched larvae. It is shown that in 1934 and 1935 the injury made by young orange worms on green fruits while located under the sepals did not affect the growth and thus cause stunted or peewee oranges, nor did it appreciably affect the grade of the fruit.

Orange worms in California and their control, A. J. BASINGER and A. M. BOYCE (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 161–168*).—In experimental work at the California Citrus Experiment Station, mainly with the orange tortrix but to some extent with *Holcocera iceryaeella* Riley and *Platynota stultana* Wals., satisfactory control has been obtained in the laboratory and in the field through the use of cryolite, both the natural and synthetic product, and barium fluosilicate applied as dusts and sprays. "Present indications are that cryolite and barium fluosilicate may be combined with certain of the regularly used oil-spray mixtures for scale insect and citrus red mite control, with nicotine and derris compounds (barium fluosilicate with nicotine sulfate excepted) for citrus aphid control, with sulfur dust for citrus thrips control, and with zinc oxide for correction of the mottle-leaf disease of citrus. None of the organic compounds as used were effective."

Notes on the European pine shoot moth, R. B. FRIEND and H. W. HOOCK (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 210–214*).—This contribution from the Connecticut [New Haven] Experiment Station supplements the accounts previously noted (E. S. R., 69, p. 80; 70, p. 211; 71, p. 350; 74, p. 372).

European corn borer on the eastern shore of Virginia, H. G. WALKER, L. D. ANDERSON, and C. R. WILLEY (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 202–204*).—A brief account is given of the occurrence of the European corn borer on

the eastern shore of Virginia since its first discovery in lima beans shipped from Temperanceville, Va., in October 1931.

Studies on the rice-borer.—III, On the population density of the rice-borer, C. HABUKAWA, R. TAKATO, and S. KUMASHIRO (*Ber. Ōhara Inst. Landw. Forsch., 7 (1935), No. 1, pp. 1–97, figs. 22*).—Following a brief introduction, this third contribution (E. S. R., 67, p. 435) considers the methods of study (pp. 4–6), the results of observations conducted (pp. 6–41), with a general discussion (pp. 41–58), and factors which control the population of the Asiatic rice borer (pp. 59–93).

Bark beetles and other possible insect vectors of the Dutch elm disease Ceratostomella ulmi (Schwarz) Buisman, C. W. COLLINS, W. D. BUCHANAN, R. R. WHITTEN, and C. H. HOFFMANN (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 169–176*).—Laboratory and field observations are reported on the biology of and transmission experiments with the smaller European elm bark beetle *Scolytus multistriatus* Marsham and the native elm bark beetle *Hylurgopinus rufipes* Eich., which are found associated with the spread of the Dutch elm disease in the United States.

Progress in Dutch elm disease eradication, L. H. WORTHLEY (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 176–181*).—The status of control work with this bark beetle-transmitted disease of elms is reported upon.

Distribution of hibernated boll weevils in an Oklahoma cotton field, E. HIXSON (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 96–99, figs. 2*).—In a study of the distribution of overwintered bollweevils in a heavily infested cottonfield in southeastern Oklahoma in late May and early June 1934 the author failed to find any relationship to the nearness of adjacent woods. The weevils did, however, tend to be more numerous in that part of the field nearest alfalfa, and this tendency increased noticeably in the later examinations. Statistical analysis showed a high degree of negative correlation between weevil population and increase in distance from the alfalfa field.

Percentage and causes of mortality of boll weevil stages within the squares, G. L. SMITH (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 99–105, figs. 3*).—A study was made in eight fields in Madison Parish, La., during the cotton fruiting seasons of 1929–32, inclusive, the details of which are reported in table and graph form. It was found that "the chief factors effecting bollweevil mortality in immature stages are climate, predators, parasites, and proliferation. Of these, climate is ordinarily the most important in the case of fallen squares, although of relatively small importance in hanging squares. In both cases, the order of efficiency of the other factors seems to be parasites, predators, and proliferation. Temperature is the most important element in the climatic factor, and this has its greatest effect on squares lying on ground exposed to the sun. The effective fatal maximum temperatures lie from 96° F. upward, varying in efficiency almost directly with increase above that figure."

Field-plat and cage tests for boll weevil control, M. T. YOUNG and G. L. SMITH (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 105–111*).—The details of tests for bollweevil control conducted at Tallulah, La., in 1933 and 1934 are presented in tables. In 1933 the square infestation records of Evergreen B indicated very good weevil control in the plats treated with the two calcium arsenate and hydrated lime mixtures, but the yields were not so great as in the plat treated with calcium arsenate alone.

"The average percentage of square infestation in the three tests conducted in 1934 indicated better bollweevil control in the plats treated with calcium arsenate than in those treated with the calcium arsenate and hydrated lime mixtures, but the average yields were greatest in the plats treated with one part of calcium arsenate and one part of hydrated lime, and next greatest

in the plat treated with calcium arsenate alone. The average increased yields of seed cotton per acre in the four tests was 396 lb. for the plat treated with calcium arsenate, 399 for the plat treated with one part of calcium arsenate and one part of hydrated lime, and 271 lb. for the plat treated with one part of calcium arsenate and two parts of hydrated lime. It will be noted, however, that in three of the four tests the greatest increased yields were made in the plats treated with calcium arsenate alone. The square infestation and the yield records in three tests indicate that hydrated lime has no value for bollweevil control. These field-plat tests with lime and lime mixtures, generally speaking, verify the results in cage tests. The mixture of thiodiphenylamine and sulfur had very little, if any, effect on the percentage of square infestation, but the yield of the plat treated with the above-named mixture was 60 lb. of seed cotton per acre greater than in the untreated plat. . . . The square infestation records indicated that the calcium arsenate and copper arsenite mixture gave equally as good or better weevil control than calcium arsenate alone. . . . Derris-root dust mixtures containing 0.5, 1, and 2 percent of rotenone, based on the square infestation and yield records, gave very little, if any, weevil control. The failure of the plats treated with derris-root dust in two tests to yield as well as the untreated plats indicates that the derris-root dust mixtures when used at the rate of 4 to 6 lbs. per acre had no value as a means of bollweevil control."

Observations on Microbracon mellitor (Say) in relation to the boll weevil, J. W. FOLSOM (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 111–116, fig. 1*).—Biological observations of *M. mellitor*, the most abundant parasite of the bollweevil, made at Tallulah, La., in 1934 are here reported and supplement the account of Fenton and Dunnam previously noted (E. S. R., 62, p. 358).

Notes on a Japanese weevil, Calomycterus setarius Roelofs, in Connecticut, M. P. ZAPPE (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 193–195*).—These notes, contributed from the Connecticut [New Haven] Experiment Station, relate to an apterous otiorhynchid weevil, which first came to attention in this country at Yonkers, N. Y., in 1929 and is now known to be present in New York, Pennsylvania, Maryland, and Connecticut.

The root-weevils injurious to strawberries in Oregon, J. WILCOX, D. C. MOTE, and L. CHILDS (*Oregon Sta. Bul. 330 (1934), pp. 109, pls. 7, figs 6*).—The results of a study of the root weevils attacking strawberries in Oregon, commenced in the spring of 1926 and continued through the season of 1931, are reported. Six species have been found doing serious damage to plantings in that State, namely, the strawberry root weevil, the black vine weevil, the rough strawberry root weevil (*Brachyrhinus rugosostriatus* Goeze), the decorated strawberry root weevil (*Dyslobus decoratus* Lec.), the western strawberry root weevil (*D. ursinus* Horn), and the Lacomb strawberry root weevil (*D. wilcoxi* Van Dyke). All of these injured strawberries in a similar manner. The adult weevils feed on the leaves of the plants, eating in from the margins, while the larvae feed on the roots and crowns. Six other weevils that have been found on strawberries and are thought to be potential enemies are *D. granicollis* Lec., *D. simplex* Van Dyke, *Plinthodes taeniatus* Lec., *Sciopithes obscurus* Horn, *Panscopus torpidus* Lec., and *Geoderces* sp. Four additional species of weevils, namely, *Trigonoscuta pilosa* Mots., *Thricolepis inornata* Horn, the clover-root weevil, and *Cleonus kirbyi* Casey, have been found on strawberries but at the present time are thought to be of little importance.

In reporting upon their biology and control it is pointed out that many of the strawberry root weevils are parthenogenetic, a fact which largely explains why they can reproduce and become destructive in so short a time. "The strawberry root weevil and its close relatives, *Brachyrhinus* spp., pass the

winter principally in the grub stage, although in some parts of Oregon, at higher elevations than the Willamette Valley, the adults also overwinter. These overwintering grubs pupate (form cocoonlike cells) in the ground and change to the adult weevil stage at berry harvest.

"The decorated strawberry root weevil and its close relatives, *Dyslobus* spp., differ from the above group in their life history in that they overwinter in the adult stage in the ground. The adults come out of the ground early in the spring, in March, and feed on the leaves of the strawberry. These weevils lay eggs in April and May and the resulting grubs feed on the roots of the strawberry until late summer, when they pupate and change to adults."

While cultural practices have been the most efficient and practical of all methods heretofore used for the control of these pests, poison baits have become the accepted method for their control. Two types have been developed as a result of the control experiments at the station, namely, the apple poison bait and the bran poison bait. Of the various insect poisons that have been tested, calcium arsenate and sodium fluosilicate have given the most consistent results in the control experiments. The poison apple bait consists of 95 lb. of dried apple peelings and 5 lb. of the insect poison. The bran bait may be made by the following formula: Bran, 50 lbs.; water, 5 gal.: sugar, 10 lb.; and calcium arsenate or sodium fluosilicate (98 percent pure), 5 lb.

The study has shown that the common strawberry root weevils, *Brachyrhinus* group, can be controlled by the application of bait when from 75 to 90 percent of the pupae have changed to adults, and this is usually made during berry harvest.

A list is given of 225 references to the literature.

Consideration of the fire ant Solenopsis xyloni as an important southern pest, M. R. SMITH (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 120–122*).—The ant *S. xyloni*, which occurs within an area bounded on the north approximately by the thirty-fifth degree of latitude and extending from the Atlantic to the eastern boundary of Arizona, with the exception of most of Florida, where it is replaced by the fire ant (*S. geminata*) and its subspecies, is especially abundant and troublesome in the Gulf coast region. Experiments with poison baits have failed to bring entirely satisfactory results, but experimental fumigation of the nests where accessible in the soil has given promise.

The blackberry mite in Oregon (Eriophyes essigi Hassan), W. D. EDWARDS, K. W. GRAY, J. WILCOX, and D. C. MOTE (*Oregon Sta. Bul. 337 (1935), pp. 35, figs. 12*).—The blackberry mite, which appeared in California in 1921 and was reported by Essig (E. S. R., 54, p. 559) but first came to the attention of the Oregon Station in 1930, has spread until it now occurs in the coastal area from Mexico to Bellingham, Wash. A summary of information on the pest and the results of control work commenced in 1930 and extending through 1934 are presented.

This mite spends the entire year on the vines, overwintering in the buds and other protected parts of the plant and infesting the fruit after it has set in the summer. Its host list includes a large number of plants, of which the Evergreen and Himalaya blackberries are the most important. While the predaceous mite *Seius pomi* Parrot has been found of considerable value in its control, the application of sprays is essential to a normal harvest of fruit. Spray control work, the details of which are presented in tables, has led to the suggestion of three two-spray programs that include the use of summer oil or lime-sulfur in the fall spray and lime-sulfur as a delayed dormant spray, and two single-spray programs, the first consisting of the delayed dormant spray and the latter of a fruit spray of summer oil. The summer oil as a fruit spray is recommended only as an emergency measure when no sprays have been

applied previously. It is pointed out that the preblossom spray of either wettable sulfur or of dilute lime-sulfur has caused burning or yellowing during the past three seasons in the Willamette Valley and hence cannot be recommended.

The citrus red mite Paratetranychus citri McG. in California and its control, A. M. BOYCE (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 125–130*).—In work by the California Citrus Experiment Station, mineral oil sprays have been found to be ideal for the control of the citrus red mite, which is increasing in importance in that State. There are, however, certain conditions under which oil sprays are undesirable with respect to the citrus tree, and at present the most promising material other than oil is said to be Selocide, a proprietary selenium compound developed by Gnadinger in 1931 (E. S. R., 70, p. 208), although in certain areas, and under certain conditions in all areas, the Selocide combinations used have not always given satisfactory results. Further work with selenium, sulfur, naphthalene, thiocyanates, oils, and other materials is said to be in progress.

Life history of Agamermis decaudata, a nematode parasite of grasshoppers and other insects, J. R. CHRISTIE (*Jour. Agr. Res. [U. S.], 52 (1936), No. 3, pp. 161–198, figs. 20*).—Studies conducted at Falls Church, Va., of the biology of *A. decaudata*, a mermithid parasite of grasshoppers and some other insects, which is found throughout the northeastern part of the United States, southward to Virginia and westward to Nebraska, are reported upon.

Adults occur in the soil, where eggs are deposited. Hatching takes place between late June and mid-July. Larvae migrate to the surface of the soil, climb the vegetation, and enter the body cavity of recently hatched grasshoppers by penetrating the body wall. At this time the body of the larval parasite is severed at a region called the node and the posterior four-fifths remains outside the host. Parasitic development requires from 1 to 3 mo., and during this time reserve food materials are stored in the modified intestine or trophosome. Apparently food is taken only during the parasitic stage. The parasites emerge by forcing their way through the body wall and enter the soil. Molting takes place the following summer, after which females deposit eggs until the advent of cold weather. Egg laying is resumed in the spring and again continues until cold weather. The supply of stored food material is now exhausted and the animals die. Infested grasshoppers are retarded in their development, and females are usually rendered sterile. The emergence of the parasite always kills the host. The morphological development of the parasite is discussed.

A list of 22 references to the literature cited is included.

Evidence of the apparent deep penetration and hystolytic action of a mouth inhabiting amoeba, D. C. LYONS (*Dental Survey, 11 (1935), No. 10, pp. 24–27; abs. in Michigan Sta. Quart. Bul., 18 (1936), No. 3, pp. 196, 197*).—Histological evidence is presented apparently showing that a mouth-inhabiting ameba, which morphologically resembles *Endamoeba gingivalis*, deeply penetrates the gingival tissue and causes tissue destruction.

ANIMAL PRODUCTION

Bound water and phase equilibria in protein systems: Egg albumin and muscle, T. MORAN (*Roy. Soc. [London], Proc., Ser. B, 118 (1935), No. 811, pp. 548–559, figs. 2*).—In studies at the Low Temperature Research Station, Cambridge, the bound water of native egg albumin and of egg albumin denatured by heat and by urea was determined at different activities of water from observations on the equilibrium in the frozen state and under an applied pressure. It was found that the chemically bound water was approximately

0.26 g per gram of protein for both of these proteins, but the water held more loosely at high activities was lower in the denatured protein.

Measurements of the water content of muscle in equilibrium with ice at different temperatures and activities of water showed that the eutectic temperature of the muscle was approximately —37.5° C. The bound water of muscle was small, and at intermediate or high activities of water was about 0.4 g per gram of dry solid.

The nutritive value of skim-milk powders, with special reference to the sensitivity of milk proteins to heat, B. W. FAIRBANKS and H. H. MITCHELL (*Jour. Agr. Res.* [*U. S.*], *51* (*1935*), *No. 12, pp. 1107–1121*).—A series of paired feeding tests and nitrogen metabolism studies with growing rats was undertaken at the Illinois Experiment Station for the purpose of determining the protein values and the net energy values of a number of skim milk powders prepared from the same milk sample by the roller and the spray processes under different conditions of time and temperature. From the numerous data secured the authors came to the following conclusions:

The proteins of milk are very sensitive to the intensities and durations of heat treatment employed in commercial drying. In the preparation of choice commercial roller-process powders or of preheated spray-process powders, the preheating process lowers the biological value of the protein from about 90 to 82, although its digestibility is not appreciably affected. This initial decline in biological value of milk proteins is due to a partial destruction of cystine.

As the temperature of drying in the roller process is increased until perceptible scorching occurs, the biological value of the milk proteins is rapidly lowered from 82 to 70 or less, due to the destruction of lysine. The digestibility of the milk proteins is also lowered at the scorching point in the roller-drying process. However, even with extreme scorching the net energy value appears to be but slightly (if at all) affected. The total solids and nitrogen of dry skim milk powders were more soluble in spray-process powders than in roller-process powders, and the former were brighter in color than the latter.

Pasture value of different grasses alone and in mixture, G. E. RITCHEY and W. W. HENLEY (*Florida Sta. Bul. 289* (*1936*), *pp. 28, figs. 9*).—In cooperation with the U. S. D. A. Bureau of Plant Industry this study was undertaken to determine the relative grazing value of Bahia, Bermuda, carpet, and centipede grasses. The value of each was obtained from the relative yields of grass and the relative amounts of beef produced by grazing these grasses with native steers. Four pastures were seeded to pure stands of the above grasses, while a fifth pasture was seeded to a mixture of them.

Yields as measured by lawn mower clippings were highest in the Bahia and mixed grass pastures and lowest in the centipede grass pasture. The yields of grass were heaviest during the rainy season from mid-June to mid-September, and a sudden drop in yield occurred shortly after the end of the rainy season. The crude protein content was highest in the carpet grass and lowest in the centipede grass pastures. The carpet grass did not do well on the type of soil represented in this study.

Cattle made the largest gains on the centipede grass. Mineral consumption increased during succeeding grazing seasons, indicating a possible depletion of mineral elements in the soil. With the exception of centipede grass, there was a close correlation between grass yields and cattle gains. The growing habits of the centipede grass, which made it difficult to clip a large portion of the plant, were at least partially responsible for the different ratio obtained on this pasture.

Analyses of the ash constituents of Swedish roughages [trans. title], S. ODÉN and T. WIJKSTRÖM (*K. Landtbr. Akad. Handl. och Tidskr., 74 (1935), No. 4, pp. 479–537, figs. 2; Eng. abs., pp. 533, 534*).—The mineral composition of Swedish roughages is given in tabular form in this report from the Central Agricultural Experiment Station.

The average percentage analyses of all hay samples on a dry matter basis was nitrogen 2.15, total ash 7.74, calcium oxide 1.19, phosphoric acid 0.62, potassium oxide 2.19, sodium oxide 0.19, magnesium oxide 0.29, iron oxide 0.067, manganese oxide 0.0085, sulfur 0.49, chlorine 0.71, and silica 1.22.

It was found that fertilizing with superphosphate on land deficient in phosphorus resulted in a 50 percent increase in the phosphorus content of the crop. The differences in the ash constituents of grains differed less than in the case of roughages. The ash of roots usually contained a well-balanced proportion of calcium and phosphorus, but otherwise the mineral content varied widely.

The antirachitic activity of various parts of the corn plant at the time of ensiling, H. E. BECHTEL and C. A. HOPPERT (*Michigan Sta. Quart. Bul., 18 (1936), No. 3, pp. 153, 154*).—Biological assays of various portions of the corn plant for their content of vitamin D showed that those portions going into corn silage which were dried in the field furnished the largest amounts of vitamin D. These included tassels, silk, and dried leaves.

The hardness of cottonseed cake as related to its suitability for feeding, G. S. FRAPS and C. D. MARRS (*Texas Sta. Bul. 523 (1936), pp. 27, fig. 1*).—In order to study the hardness of cottonseed cake as related to feeding, a method was devised whereby the force required to crush the cottonseed cake between flat surfaces measured the hardness of the cake.

The average crushing strength of cracked cottonseed cake varied from 127 to 3,698 lb. and of slab cake from 710 to 3,427 lb. The average ball tests for cracked cake varied from 92 to 607 lb. and for slab cake from 186 to 493 lb. Crushing tests for the molar teeth of cows ranged from 1,080 to 4,550 lb. with an average of 2,165 lb., while for sheep the range was from 420 to 1,430 lb. with an average of 1,108 lb. The size and shape of the sample markedly affected the crushing strength, with the smaller pieces being lower in this respect. The "boot heel test" used by stockmen to determine the hardness of cake crushed samples with a crushing strength of less than 450 lb. Soaking in water decreased the crushing strength of a sample about one-third for the first 5 min. of soaking and about one-half for 20 min. of soaking.

Feeding tests with cattle and sheep showed that while size, shape, and hardness of cake had some effect on consumption, the individuality of the animal appeared to be the controlling factor. On the basis of these results, cake with a crushing strength of less than 400 lb. was tentatively classified as soft, that with a crushing strength of 401 to 1,500 lb. as medium hard, that with a crushing strength of 1,501 to 2,500 lb. as hard, and that with a crushing strength of over 2,500 lb. as very hard for cows.

Haddock meal: Effect of manufacturing process upon nutritive values, H. S. WILGUS, Jr., L. C. NORRIS, and G. F. HEUSER (*Indus. and Engin. Chem., 27 (1935), No. 4, pp. 419–422*).—The [New York] Cornell Experiment Station made a study of the effect of the manufacturing process upon the nutritive value of haddock meal. White Leghorn chicks were used for determining the relative protein efficiency and the relative growth-promoting vitamin G content of 13 samples of meals rendered and dried in various ways.

Dry-rendered meals had a greater protein value and 50 percent more vitamin G than those wet-rendered by a similar process of drying. A flame-dried meal was of inferior value. The use of a vacuum with steam drying aided in the

preservation of the vitamin G content but did not improve the relative protein efficiency over that obtained without the use of the vacuum. Doubling the size of the charge had a slight beneficial effect. The vitamin G content was best preserved by not pregrinding the raw scrap.

The effect of the ingestion of saline waters upon the pH of the intestinal tract, the nitrogen-balance, and the coefficient of digestibility, V. G. HELLER, J. R. OWEN, and L. PORTWOOD (*Jour. Nutr., 10 (1935), No. 6, pp. 645–651*).—Continuing these studies (E. S. R., 72, p. 824) at the Oklahoma Experiment Station, it was found that the use of drinking waters containing considerable quantities of dissolved salts did not interfere with the nitrogen utilization of normal rations. The apparent coefficients of digestibility of the constituents of the rations were not interfered with. The trend of all determinations indicated that assimilation or digestibility was aided by the presence of reasonable amounts of salt so long as the total content was below the concentration where serious disturbances in growth and reproduction took place. The pH of the entire intestinal tract was not appreciably changed by the presence of alkali or acid salts in the drinking water, provided the concentration did not exceed the amount permitting a somewhat normal life. The observed changes were more apparent in the stomach than in the lower intestine.

Selenium in proteins from toxic foodstuffs.—II, The effect of acid hydrolysis, E. P. PAINTER and K. W. FRANKE (*Cereal Chem., 13 (1936), No. 2, pp. 172–179*).—This series of studies (E. S. R., 75, p. 90) has been continued at the South Dakota Experiment Station.

In this phase of the work it was found that when toxic proteins were hydrolyzed with hydrochloric acid and sulfuric acid a part of the selenium appeared in the insoluble humin and a part in the soluble hydrolysate. Increasing the humin formation by the addition of carbohydrates or hydrolyzing with stronger acids greatly increased the proportion of selenium in the humin fraction. Hydrolyzing with hydrochloric acid resulted in a selenium-free hydrolysate. Isolated tryptophan and tyrosine contained only small amounts of selenium, which was probably a contaminant. It appeared probable that selenium could replace the sulfur in the amino acids cystine and methionine.

Selenium in proteins from toxic foodstuffs.—III, The removal of selenium from toxic protein hydrolysates, E. P. PAINTER and K. W. FRANKE (*Jour. Biol. Chem., 111 (1935), No. 3, pp. 643–651*).—Toxic proteins were hydrolyzed and removal of the selenium attempted by various methods in this phase of the work. Most of the selenium was found to pass into the butyl alcohol when extracted from a nearly neutral hydrolysate. Precipitations were carried out with phosphotungstic acid, copper, silver, and mercury salts, and in all cases a fraction of the selenium was in the precipitate. A procedure was developed with mercuric chloride in which all of the selenium compounds were precipitated.

Selenium in proteins from toxic foodstuffs.—IV, The effect of feeding toxic proteins, toxic protein hydrolysates, and toxic protein hydrolysates from which the selenium has been removed, K. W. FRANKE and E. P. PAINTER (*Jour. Nutr., 10 (1935), No. 6, pp. 599–611, figs. 2*).—Growth studies were conducted with rats to determine the relative toxicity of the grain, the of toxic protein hydrolysates so nearly completely precipitated the selenium would make the protein hydrolysate nontoxic. It was found that the sulfuric acid hydrolysates of toxic proteins were toxic. Mercuric chloride precipitation of toxic protein hydrolysates so nearly completely precipitated the selenium compound that the filtrate was harmless when fed to rats. Mercuric chloride

precipitation removed from sulfuric acid hydrolysates something which directly or indirectly inhibited growth.

The effect of calcium carbonate and sodium bicarbonate on the toxicity of gossypol, W. D. GALLUP and R. REDER (*Jour. Agr. Res. [U. S.], 52 (1936), No. 1, pp. 65–72*).—Continuing these studies on gossypol (E. S. R., 74, p. 242) at the Oklahoma Experiment Station, an investigation was made to determine the proportion of sodium bicarbonate and calcium carbonate which would offer the greatest degree of protection against gossypol injury and to determine the value of each salt in the presence of moderate amounts of the other. Young rats were fed diets made up with 10 percent of cottonseed containing 0.6 percent of gossypol. Varying amounts and proportions of the above salts were added to this diet and to a diet made with gossypol-free cottonseed.

Best growth was obtained with a diet to which 2 percent of each of the salts had been added. Next in value were diets to which had been added 3 percent of sodium bicarbonate or a combination of 2 percent of calcium carbonate and 1 percent of sodium bicarbonate. It was apparent from the results with the control rats that the beneficial effect of these salts was due to their action on gossypol and not merely to their influence on the nutritive properties of the basal ration.

The value of sodium bicarbonate combined with calcium carbonate or in the presence of normal amounts of dietary calcium was attributed to its solubility, with the production of an alkaline medium in which gossypol was unstable and susceptible of precipitation. Support of this belief was obtained in a study of the effect of gossypol on the hydrolysis of fat by lipase, a process which was activated by calcium. It is concluded that the action of calcium carbonate and sodium bicarbonate in gossypol diets is one of detoxication, involving a reaction between gossypol and calcium in an alkaline medium.

Avitaminoses in animals, R. GRAHAM, H. H. MITCHELL, and V. M. MICHAEL (*Illinois Sta. Circ. 449 (1936), pp. 16, figs. 6*).—This publication contains a compilation of information regarding the known vitamins, the recognized diseases resulting from a deficiency of each, the symptoms of these diseases in different kinds of livestock, together with other symptoms and lesions ascribed to their deficiency, and means for prevention and treatment of the various conditions.

[Livestock investigations in Colorado] (*Colorado Sta. Rpt. 1935, pp. 10, 11, 13, 14, 15, 31*).—Data obtained in studies with livestock are reported on wintering range calves on North Park hay, mineral supplements for fattening cattle and lambs, the mineral content of some Colorado range forages and range soils in their relation to certain nutritional deficiency diseases of livestock, vitamin content of mountain meadow hay plants of Colorado, and phosphorus deficiency of range cattle.

[Investigations with livestock in Georgia] (*Georgia Coastal Plain Sta. Bul. 25 [1935], pp. 42–63, figs. 5*).—Data obtained in pasture investigations with beef cattle are reported on lowland permanent pastures; upland permanent pastures; and temporary pastures consisting of kudzu, oats followed by common lespedeza, Australian winter peas, hairy vetch, and oats followed by Sudan grass, and Abruzzi rye followed by soybeans.

In studies on beef cattle production, results are reported on the production of veal calves, the production of feeder calves, wintering feeder calves, and rations for fattening steers.

Tests with swine yielded information on the feeding and management of spring and fall litters of pigs.

[Investigations with livestock in Nebraska] (*Nebraska Sta. Rpt. [1935], pp. 8, 23–28, 29, 30, 34, 35, 38*).—Experiments with beef cattle produced results on cottonseed cake, tankage, and 22 percent protein cubes as supplements to a

silage ration; grainless silage, cottonseed cake, and a half-feed of corn for yearling and heifer calves; finishing yearling and calf heifers after a wintering ration of silage, cottonseed cake, and limited amounts of corn; long alfalfa, alfalfa meal, and alfalfa meal and cottonseed cake for fattening yearling steers; the seeding and carrying capacity of temporary pastures: wintering and fattening steer calves at the North Platte Substation; and the effect of winter ration on the development of range heifers that calve as 2-year-olds at the Valentine Substation.

With swine, information was obtained in tests on growing pigs on Sudan grass pasture, full-feeding pigs on Sudan grass pasture, protein supplementary mixtures for dry-lot pig feeding, supplementing the corn and tankage ration for pigs in dry lot, the efficient utilization of tankage by pigs in dry lot, and soybean oil meal and tankage fed with ground wheat to fattening hogs.

The breeding record of a short-tailed Hampshire ram is reported.

The data obtained in poultry studies are reported on the comparative efficiency of animal and vegetable proteins in poultry feeding; the incubation of turkey eggs; the calcium utilization of growing turkeys; the relationship of the protein level in the growing ration to the subsequent stamina of the flock; and the antirachitic value of the cod-liver oil byproduct stearine.

Beef cattle breeding, D. J. SCHUTTE (*Union So. Africa Dept. Agr. and Forestry Bul. 136 (1935), pp. 39, figs. 19*).—In this report the author discusses the problems of beef cattle breeding in the United States and points out the application of this information to cattle improvement in the Union of South Africa.

Relative efficiency and profitableness of three classes of feeder cattle, V. P. GERLAUGH and C. W. GAY (*Ohio Sta. Bimo. Bul. 179 (1936), pp. 38–40*).—Continuing this study (E. S. R., 73, p. 521), three lots of choice yearling steers, choice steer calves, and choice heifer calves were fed for 168 days on a ration of corn, protein supplement, silage, and alfalfa hay. Shelled corn was fed from November 20 to April 9 and corn-and-cob meal from April 9 to May 7. At this time the average daily gains were 2.3, 2.5, and 2.2 lb. per head in the respective lots. The yearling and steer calves were then continued on the same ration to the end of a 275-day feeding period. The average daily gains at this time were 2 and 2.2 lb. per head, respectively.

The return per bushel of corn fed was $1.40, $1.52, and $1.80 in the respective lots. At the end of the 168-day period the steer calves had made the most economical gains and the yearling steers the most expensive. At the end of 275 days the steer calves were still more economical than the yearlings.

Corn-and-cob meal versus shelled corn for fattening yearlings and calves, P. GERLAUGH and H. W. ROGERS (*Ohio Sta. Bimo. Bul. 179 (1936), pp. 34–38*).—Continuing this study (E. S. R., 73, p. 522), two lots of yearlings averaging 677 lb. were fed for 173 days and two lots of calves averaging 405 lb. were fed for 287 days. Lot 1 in each group was fed corn-and-cob meal and lot 2 shelled corn. In addition, all lots were fed a protein supplement, silage, and hay, with the exception that the calves received no silage during the last 78 days. The average daily gains were 2 and 2.8 lb. per head, respectively, for the calves and yearlings on corn-and-cob meal and 2 and 2.7 lb. for the calves and yearlings on shelled corn. The cost per unit of gain was less in each case when corn-and-cob meal was fed. More gain was obtained on pigs following the cattle fed shelled corn than on those following the corn-and-cob meal cattle. There was no apparent difference in the condition of the cattle fed the two kinds of corn.

Summarizing the results obtained in the entire experiment, it was found that in each case cattle fed corn-and-cob meal outgained cattle fed shelled corn, and yearling steers outgained calves. With the values assigned to cattle gains, hog

gains, and feed, there was a balance of $4.34 in the case of calves and $5.90 in the case of yearlings in favor of 100 bu. of corn as corn-and-cob meal. This advantage would have to cover the cost of grinding in order to make feeding corn in this form profitable. No difficulties were experienced with either ration, but it appeared a little easier to hold cattle fed corn-and-cob meal on feed during hot weather. There was no apparent difference in finish of the animals due to the ration. On the basis of these results it was apparent that if no pigs were available to follow the cattle, the corn should be ground.

Adding supplement to corn for calves on bluegrass pasture, P. GERLAUGH (*Ohio Sta. Bimo. Bul. 179 (1936), pp. 40, 41*).—In this test two lots of 12 calves each averaging 460 lb. per head, were fed for 182 days on bluegrass pasture. Lot 1 received corn alone as a supplement to pasture and lot 2 corn and cottonseed meal. The average daily gain was 1.7 lb. per head in both lots. There was no apparent difference in the finish, but it cost 11 ct. more to produce 100 lb. of gain in lot 2 than in lot 1.

Fattening steer calves: Quantity of supplement, P. GERLAUGH (*Ohio Sta. Bimo. Bul. 179 (1936), pp. 31–33, fig. 1*).—In this study five lots of calves averaging approximately 404 lb. per head initial weight were fed for 308 days on a basal ration of shelled corn, silage, and hay. In addition, a supplement of dry rendered tankage, soybean oil meal, cottonseed meal, linseed meal, limestone, steamed bonemeal, and salt 30:30:20:15:2:2:1 was fed in each lot. Lot 1 received 0.8 lb. of this supplement per head daily throughout the test. Lot 2 was fed 0.8 lb. during the first 12 weeks, 1.6 lb. during the next 12 weeks, 2.4 lb. during the third 12 weeks, and 3.2 lb. during the last 8 weeks. Lot 3 received 2.4 lb. per head daily during the entire test. Lot 4 was fed 2.4 lb. during the first 12 weeks, 1.6 lb. during the second 12 weeks, 0.8 lb. during the third 12 weeks, and no supplement during the last 8 weeks. Lot 5 received 1.6 lb. during the test. The average daily gains in the respective lots were 2.1, 2.4, 2.3, 2.3, and 2.4 lb. per head. Lot 1 attained a less desirable finish than the remaining lots. The cost of feed per 100 lb. gain was highest in lot 3 and lowest in lots 4 and 5, but the difference in any case was not great.

Oats and dried molasses beet pulp for supplementing alfalfa hay in winter rations for breeding ewes, W. F. DICKSON and F. BARNUM (*Montana Sta. Bul. 312 (1936), pp. 8*).—These feeding trials were conducted with three lots of ewes in each of two winter periods. The lots were fed for 112 days on a basal ration of alfalfa hay supplemented in lots 1 and 2 with 0.33 lb. of oats and dried molasses beet pulp, respectively.

The results of the two trials varied but slightly. The gains per ewe during the feeding period were essentially the same on all rations, and the substitution of either oats or beet pulp had no effect on gain. On the basis of the results obtained it was estimated that 100 lb. of either oats or dried molasses beet pulp was equal in feeding value to 222 lb. of alfalfa. The small differences in the percentage of lambs dropped and weaned and in the average birth and weaning weights were not attributed to the rations. Ewes fed alfalfa alone produced fleeces averaging 0.1 lb. heavier than the fleeces of ewes fed the supplements.

Woolfat and suint in Merino sheep: Distribution over the body and the effects of nutrition and season thereon, F. N. BONSMA and J. S. STARKE (*So. African Jour. Sci., 31 (1934), pp. 371–393, figs. 13*).—This study at the University of Pretoria was undertaken to determine the effect of nutrition and season on the secretion of wool fat and suint in Merino sheep and also the distribution of these substances over the fleece. Two lots of sheep were used, one of which was fed a constant ration, while the other lot was fed

during the first half of the period on a low and during the last half on a high protein diet. The study lasted 15 mo., and at 3-mo. intervals wool samples were taken on each sheep.

Individuality was of fundamental importance, and the results showed that wool fat and suint were primarily inherent characteristics. The rump contained the largest amount of wool fat, followed by the withers, thigh, midrib, and shoulder areas, while the belly wool was quite low in this factor. The back contained more wool fat than the sides, and the hindquarters more than the forequarters. The belly wool contained the highest amount of suint, but there was no significant difference in the amounts in the other areas. Suint was found to be closely correlated with moisture, but wool fat and suint were in no way correlated. Wool fat was negatively correlated with yield. Neither of the rations used seemed to have any influence upon the secretion of yolk, and there appeared to be no variations due to seasonal influence.

Blood chemistry of swine.—II, Further studies of blood changes following the ingestion of glucose, D. F. and M. W. EVELETH (*Jour. Biol. Chem., 111 (1935), No. 3, pp. 753–756*).—Continuing this study (E. S. R., 72, p. 372), it was found that the feeding of glucose to fasting swine increased the serum magnesium and oxalic acid and decreased the inorganic phosphate and calcium.

The effects of low-phosphorus rations on growing pigs, C. E. AUBEL, J. S. HUGHES, and H. F. LIENHARDT (*Jour. Agr. Res. [U. S.], 52 (1936), No. 2, pp. 149–159, figs. 2*).—The Kansas Experiment Station reports the results of two feeding experiments in which young pigs were fed rations differing only in phosphorus content. Three lots of six pigs each were used in each of the experiments which were conducted for 24 weeks each. In the first experiment the respective lots received rations containing 0.15, 0.29, and 0.59 percent phosphorus for 7 weeks and rations containing 0.18, 0.33, and 0.59 percent phosphorus for 17 weeks. In the second experiment the respective lots received 0.15, 0.23, and 0.3 percent phosphorus throughout the entire period.

The results indicated that a low phosphorus diet caused a loss of appetite, poor utilization of feed and storage of energy, a failure to make normal growth and to develop bone and muscle normally, a lowering of inorganic phosphorus in the blood, and a marked increase in thirst with a corresponding excretion of urine.

Value of Sudan grass pasture in a fattening ration for swine, Q. WILLIAMS ([*Oklahoma*] *Panhandle Sta., Panhandle Bul. 59 (1936), pp. 10–14*).—In this test two lots of 12 pigs each averaging approximately 88 lb. per head were fed for 60 days on the same basal ration of ground milo and tankage self-fed free choice. One lot of pigs had free access to 0.5 acre of Sudan grass, while the other group was fed in dry lot. The average daily gains in the respective lots were 1.9 and 1.8 lb. per head. The pigs on pasture required 9.6 percent less milo and 37.1 percent less tankage per unit of gain than those in dry lot. The use of Sudan grass pasture effected a saving of 11.6 percent in the cost of other feeds required to produce 100 lb. of gain as compared with no pasture.

The progress of the distribution of salt in ham during the curing process, R. C. MILLER and P. T. ZIEGLER (*Jour. Agr. Res. [U. S.], 52 (1936), No. 3, pp. 225–232, fig. 1*).—At the Pennsylvania Experiment Station experiments were made to determine the degree of distribution of salt in hams cured by different methods, the salt distribution being related to the time allotted to the curing process proper and the time of any subsequent holding or aging. A total of 59 hams was used in this work.

A statistical method is presented which permits the mathematical expression of the extent of the distribution of salt in ham at various stages in the curing

process. The salt did not become well distributed throughout the meat in hams cured by different methods until about 60 days after the beginning of the cures. In dry-cured hams salt equalization began as soon as the last portion of the curing mixture was applied. In brine curing, salt equalization was accompanied by absorption of salt from the brine until the meat was removed from it, after which salt equalization alone took place. With all of the methods used, aging the hams for 30 days after removing from the cure permitted further equalization of the salt and gave a product of more uniform salt content.

Poultry management, L. F. PAYNE (*Kansas Sta. Circ. 178 (1936), pp. 77, figs. 27*).—This is an enlarged and revised edition of Circular 122, previously noted (E. S. R., 55, p. 265).

Thyroid weight and sex in newly hatched chicks, S. D. ABERLE and W. LANDAUER (*Anat. Rec., 62 (1935), No. 4, pp. 331–335*).—The Yale University School of Medicine determined the actual and relative thyroid weight of more than nine hundred newly hatched chicks. The birds came from matings of White Leghorns, homozygous Frizzles, and reciprocal crosses between these breeds.

Within each group the actual and relative weight of the thyroid was greater in females than in males. The average relative thyroid weight was 12.8±0.19 mg in males and 14.1±0.2 mg in females, with a difference of 1.3±0.28 mg. This significant difference suggested the existence of an actual skeletal difference of thyroid weight in newly hatched chicks.

Chick feeding, J. G. HALPIN and C. E. HOLMES (*Wisconsin Sta. Bul. 434 (1936), pp. 24, figs. 7*).—The nutritive requirements of chicks and the feeding value of various ingredients used in chick rations, together with information on the methods of feeding, are discussed.

Mineral and vegetable protein supplements for chickens, D. C. KENNARD and R. M. BETHKE (*Ohio Sta. Bimo. Bul. 179 (1936), pp. 49–54*).—In this article the authors discuss the minerals generally considered essential to meet the requirements of chickens and the source of these minerals, the kind and quantity of minerals needed, vegetable protein supplements, and soybean oil meal v. milk for poultry.

Broiler production: An adjustable broiler ration, an adjustable range feeder, R. H. WAITE (*Maryland Sta. Bul. 385 (1935), pp. 357–367, figs. 13*).—The suitability of different breeds of chickens for broiler raising and the housing, management, and feeding of broilers are discussed, together with information on the design of a range feeder.

The relation of pauses to rate of egg production, I. M. LERNER and L. W. TAYLOR (*Jour. Agr. Res. [U. S.], 52 (1936), No. 1, pp. 39–47, fig. 1*).—At the California Experiment Station a study was made with a selected population of 578 White Leghorns in their pullet year to determine whether or not pausing bears any relation to the rate of production and to evaluate the accuracy of some methods for its calculation. Three series of birds, hatched in three consecutive years, were represented in the total population, and each series was treated separately.

The analyses showed that the condition of winter pause was causally distinct from that of spring pause and was entirely separate from it. The view that winter pause was merely a manifestation of low winter rate was found untenable. A linear regression of spring rate on winter rate was observed. Evidence indicated the possibility of the same genetic factor controlling both winter and spring rate of production.

The relation between the vitamin A and D intake by the hen and the output in eggs, W. C. RUSSELL and M. W. TAYLOR (*Jour. Nutr., 10 (1935),*

No. 6, pp. 613–623).—The New Jersey Experiment Stations conducted an investigation to determine the relationship between the vitamin A and D intake and the quantity of these factors appearing in eggs.

The output of vitamin A, calculated as the percentage of that consumed, varied from 11 to 32 percent, depending upon the number of units of the factor consumed, the number of eggs produced, and the potency of the yolk. The highest percentages were obtained during high production. The liver vitamin A of the hen varied inversely with egg production. The amount of the vitamin D factor which appeared in the eggs was 10 percent of that consumed. The data indicated that sunlight was more effective in increasing the antirachitic potency of the yolk than the amount of cod-liver oil commonly fed.

The relationship of the dressed carcass to the live bird outline, W. A. and A. J. G. MAW (*U. S. Egg and Poultry Mag., 41 (1935), No. 8, pp. 15–20, figs. 15*).—This paper from Macdonald College, Canada, presents a series of X-ray photographs showing the exact relationship of feather outline to body shape in live poultry. Phantom views are also given which offer a more realistic comparison, since the body shape has been superimposed on the live bird photographs.

Produce good eggs for hatching, J. G. HALPIN and C. E. HOLMES (*Wisconsin Sta. Bul. 433 (1936), pp. 22, figs. 2*).—Methods of breeding, feeding, and management that have proved successful in the production of good hatching eggs are discussed.

The determination and importance of the condition of the firm albumen in studies of egg-white quality, A. VAN WAGENEN and H. S. WILGUS, Jr. (*Jour. Agr. Res. [U. S.], 51 (1935), No. 12, pp. 1129–1137, figs. 3*).—A photographic score for measuring the relative condition by grades of firmness of the albumen of eggs is presented from the [New York] Cornell Experiment Station. Correlations above $+0.5\pm0.05$ were observed between the grade of firmness of the albumen and the yolk mobility and visibility and the candler's grade. No correlation was found between the grade of firmness of the albumen and the percentage of various layers of albumen in fresh eggs.

The yolk color index, V. HEIMAN and J. S. CARVER (*U. S. Egg and Poultry Mag., 41 (1935), No. 8, pp. 40, 41, figs. 2*).—This paper from the Washington Experiment Station describes the "color roter", a device for mounting color standards for measuring variations in the color of egg yolks.

Rations for turkeys ([*Connecticut*] *Storrs Sta. Bul. 207 (1935), pp. 27, 28*).—The results of two comparisons of the New England Conference rations for chicks as feeds for turkeys and a manufactured turkey feed are reported.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle in Connecticut] ([*Connecticut*] *Storrs Sta. Bul. 207 (1935), pp. 20–25*).—Experiments with dairy cattle yielded information on curing hay, especially with reference to hay chopped into storage; a study of herd records of four dairy breeds and the inheritance of dairy qualities; the effect of corn gluten feed upon the acidity of freshly drawn milk; and curd tension with particular reference to the influence of mastitis, of breed, and of processing.

[Investigations with dairy cattle in Nebraska] (*Nebraska Sta. Rpt. [1935], pp. 10, 37*).—Results are reported in tests on growth studies with dairy cattle, and a comparison of grain and roughage v. grain alone for milk cows at the Scotts Bluff Substation.

The effect of udder irrigation and milking interval on milk secretion, E. R. GARRISON and C. W. TURNER (*Missouri Sta. Res. Bul. 234 (1936), pp. 39, figs. 14*).—The results of studies of the effect on milk secretion of the interval

between milkings and the injection into the udder of water, solutions of salt and lactose, milk, oil, and oxygen are reported.

Irrigation of the udder caused a decrease in milk yield and lactose content and an increase in chlorine, fat, protein, catalase, leucocytes, and the pH of the milk for several subsequent milkings. The maximum effect of this treatment occurred at the first or second milking following injection, and then slowly returned to normal. The degree of change varied with individual cows and with the amount and kind of injection. Injecting 750 ml of distilled water into 25 quarters of 7 lactating cows had less effect than the injection of a solution containing 0.12 percent of sodium chloride and 3.5 percent of lactose into the same quarters. Distilled water was less detrimental to milk secretion than any chloride solutions varying from 0.12 to 0.96 percent concentration, and the injurious effect of such solutions increased with the concentration of the solute.

Calcium chloride solutions of 0.24 and 0.48 percent concentration were more detrimental to milk secretion than sodium chloride solutions of similar concentration. Distilled water was less injurious than lactose solution, and the injurious effect of the latter solution increased with the concentration. Irrigating the udder with paraffin oil caused as much disturbance as distilled water, and recovery was much slower. Introducing oxygen at pressures equal to 20 mm and 40 mm mercury for 12 hr. affected yield and composition of milk similarly to the injection of liquids. Suspended milking for 24 hr. affected the yield and composition of milk for 3 or 4 days, but the disturbance was not as great as that produced by the injection of distilled water. When the milking interval exceeded 16 hr. milk secretion was practically inhibited, and the composition of milk became slightly altered when the period between milkings exceeded 18 or 20 hr.

The changes occurring in milk due to injections or accumulation of milk were believed to be due to the impaired activity resulting from the pressure exerted on the gland epithelium, which increased the permeability of the secreting cells to certain constituents of the blood, including the chlorides. The osmotic pressure between blood and milk was maintained by the depression in lactose synthesis.

It is concluded that distilled water is preferable to any of the solutions studied as an irrigant for the mammary gland.

The influence of food fat of varying degrees of unsaturation upon blood lipids and milk fat, L. A. MAYNARD, C. M. MCCAY, and L. L. MADSEN (*Jour. Dairy Sci., 19 (1936), No. 1, pp. 49–53, figs. 3*).—Continuing the study of food fats (E. S. R., 71, p. 689), results are reported on experiments where the distinguishing feature of the rations was the degree of unsaturation of the fat component. The course of changes in the iodine numbers of the blood lipids and milk fat was followed with cows fed in alternate periods rations containing fats of a high and low degree of unsaturation.

Following a change in ration, a marked change in the iodine number of the milk was noted in a composite of the milk secreted during the first 18 hr. in half of the cows and in all cases within the next 24 hr. The maximum change was attained within 3 or 4 days. Corresponding but less marked changes were noted in the blood. There was a close relationship between food fat and milk fat, and the data indicated that the course of fat metabolism in lactation was either very direct or the various processes took place quite rapidly.

Causes of differences in butterfat production of cows in Iowa cow testing associations, M. PLUM (*Jour. Dairy Sci., 18 (1935), No. 12, pp. 811–825, fig. 1*).—

This study at the Iowa Experiment Station was undertaken to measure the relative importance of the chief causes of variations among records of cows in Iowa cow-testing associations. The records of 95 different herds of Guernsey, Holstein, and Jersey cattle were studied.

The importance of different sources of variance is summarized in tabular form. Practically all of the 2 percent difference due to breed was found among the purebred cows, the grades showing very little difference. The 26 percent difference between cows was mostly hereditary, but included the effects of any permanent change taking place in the cow before lactation starts and the effects of continuously giving one cow better or poorer feeding and management than her herd mates. Variation in butterfat production among the cows appeared to have been determined about one-third by differences in their heredity. The uncertainty of this estimate lies in the determination of what part heredity plays in the variance arising from herd differences not connected with recorded feeding practices. The 28 percent unexplained variance includes the large discrepancies still to be expected between a cow's record and her real producing ability, even after careful corrections have been made for age, feeding, dry period, calving season, and the general level of the herd in which she is kept.

The vitamin A activity of butter produced by cows fed alfalfa hay and soybean hay cut in different stages of maturity, J. H. HILTON, S. M. HAUGE, and J. W. WILBUR (*Jour. Dairy Sci., 18 (1935), No. 12, pp. 795–800*).—Continuing the study of the vitamin A activity of butter (E. S. R., 74, p. 688), the Indiana Experiment Station made a comparison of the vitamin A activity of soybean and alfalfa hay cut at different stages of maturity and cured by two different processes. A study was made of the relationship between the vitamin A activity of the hays and the butters produced by the cows fed these hays.

It was found that artificially dried hays had a higher vitamin A potency than corresponding field-cured hays. Hays made from younger plants were superior in vitamin A value to those made from more mature plants. Alfalfa plants possessed a higher vitamin A value than did soybean plants. When fed artificially dried hays, dairy cows produced butter of higher vitamin A potency than when fed field-cured hays. Dairy cows fed artificially dried young alfalfa hay produced butter of exceptionally high vitamin A value—45 units per gram. Soybean hay made from plants after the beans were well formed in the pod suppressed the formation of vitamin A in butter sufficiently to produce a butter of only medium-high vitamin A potency. When made from young plants, soybean hay did not exhibit this suppressing effect and butter of high vitamin A activity was produced.

Influence of the ration on the vitamin C content of milk, W. H. RIDDELL, C. H. WHITNAH, J. S. HUGHES, and H. F. LIENHARDT (*Jour. Nutr., 11 (1936), No. 1, pp. 47–54*).—The Kansas Experiment Station determined the vitamin C ascorbic acid content of milk produced on a number of carefully controlled rations. Both the biological assay and the chemical test were used in these determinations. Milk from cows on pasture was compared with milk from cows in dry lot receiving either silage or dry feed alone. The results indicated that the rations studied had no significant influence on the vitamin C content of the milk.

Vitamin D in milk, T. M. OLSON and G. C. WALLIS (*South Dakota Sta. Bul. 296 (1935), pp. 52, figs. 16*).—This bulletin was prepared to discuss some of the information available on the factors influencing the amount of vitamin D in milk, its efficacy in preventing and curing rickets and in promoting adequate nutrition, and also to present the results of experimental work bearing on the effects of sunshine on the growth of dairy heifers and the vitamin D potency of the milk subsequently produced.

It is pointed out that milk produced under essentially normal conditions contains small but appreciable amounts of vitamin D varying from 5. or less, to about 15 Steenbock units per quart. Under summer pasture conditions the milk produced is ordinarily higher in antirachitic value than that produced under typical winter feeding conditions. Feeding vitamin D concentrates to cows in sufficiently large amounts also increased the vitamin D content of the milk. The value of the three types of vitamin D milk available on the market are discussed. The authors conclude with the observation that vitamin D is a relatively stable product and that there is little likelihood of deterioration during the short holding period before fluid milk is consumed or in the destruction of appreciable amounts by the common methods of processing milk.

Appended are a list of cited literature and tables showing the comparative growth and weight of calves exposed to sunlight or kept from exposure to sunlight and the results of feeding pigs milk from cows kept in the sunlight or without sunlight as compared with a group fed cod-liver oil as a check.

The differential antirachitic activity of vitamin D milks, R. W. HAMAN and H. STEENBOCK (*Jour. Nutr., 10 (1935), No. 6, pp. 653–666*).—Data obtained in experiments at the Wisconsin Experiment Station indicated that for the chick and per unit of vitamin D, irradiated milk, cod-liver oil, and irradiated cholesterol were of approximately the same effectiveness. Milk produced by feeding irradiated yeast was approximately one-tenth as effective as irradiated milk. This difference was confined to the respective butterfat fractions. The constituents of milk as vehicles for vitamin D did not influence its effectiveness. The results did not show that the baby chick could be used more effectively than the rat for determining the degree of antirachitic efficiency of different vitamins D for the human.

The comparative antirachitic efficiency of vitamin D in irradiated milk, metabolized (yeast) milk, and cod liver oil, R. M. BETHKE, W. E. KRAUSS, P. R. RECORD, and O. H. M. WILDER (*Jour. Nutr., 11 (1936), No. 1, pp. 21–30*).—The Ohio Experiment Station undertook a study to determine the comparative response of the chick to the vitamin D in irradiated milk and in milk from cows fed irradiated yeast.

The results showed that it required more than ten times the rat equivalent amount of vitamin D in metabolized (yeast) milk than in irradiated milk to produce the same antirachitic effect in chicks. The equivalent rat units of vitamin D from cod-liver oil and irradiated milk were equally efficient, antirachitically, for the chick. The vitamin D in milk resulting from feeding irradiated yeast to the cow apparently was in the same biological form as that fed to the animal. Since rat equivalent amounts of vitamin D in metabolized milk and irradiated milk were equally efficient for the rachitic infant but not for the chick, it is concluded that the infant and chick vary greatly in their response to the forms of vitamin D in these two types of milk.

Testing milk and cream, H. A. HERMAN (*Missouri Sta. Circ. 189 (1936), pp. 18, figs. 19*).—Testing whole milk, cream, skim milk, and buttermilk for fat content by the Babcock test is described. In addition, information is given on cleaning glassware, materials and equipment needed for testing, preparing composite samples, and preserving the samples for testing.

A study of variations in the lactose content of milk, W. R. BROWN, W. E. PETERSEN, and R. A. GORTNER (*Jour. Dairy Sci., 19 (1936), No. 1, pp. 81–92, figs. 4*).—A series of experiments was undertaken at the Minnesota Experiment Station to determine whether the daily and hourly variations in lactose content occurring under normal herd conditions were great enough to modify experimental results.

Analyses showed a similarity between the lactose content of the morning and evening milk of individual animals when the samples were taken at the regular milking periods. There was considerable variation between the lactose content of milk in successive hourly samples. Hourly variations were also found in the blood sugar of milking cows. Samples of blood and milk collected simultaneously showed little or no correlation as to sugar content. In general, samples of milk collected 1 hr. later than the blood samples tended to show a higher correlation in respect to sugar than did simultaneously collected samples. The difficulty of satisfactory sampling of blood and milk for comparison studies is pointed out, and an improved sampling method is suggested.

Soft-curd milk studies, M. H. BERRY (*Maryland Sta. Bul. 388 (1935), pp. 401–420, figs. 2*).—A series of studies was undertaken to obtain more information on soft-curd milk.

It was found that upon coagulation colostrum formed a very hard curd. The variation in curd tension between milkings on the same or consecutive days was small over short periods. The curd character was fairly uniform throughout lactation, except during the first few days after freshening when it was very high and toward the end of lactation when there was a slight increase in tension. In about 50 percent of the cases the average curd tension produced in one lactation varied between 10 to 30 g from the curd tension of the milk produced during another lactation. Abortion during lactation appeared to have no effect on curd tension, and the same was true of the season of the year.

Holding the milk for several days at 40° F. did not affect the curd tension when the acidity did not increase to any appreciable extent. Freezing milk had a hardening effect upon the curd. Pasteurizing at ordinary temperatures had no effect on curd tension, but a temperature of 180° for 15 min. had a marked softening effect on the curd. Heating milk with a curd tension of 30 to 80 g to the boiling point in an open container usually softened the curd to below 30 g. A hard-curd milk (50 to 112 g) could be made a soft-curd milk by viscolizing at 3,000 to 5,000 lb. pressure, and the higher the curd tension of the original milk the greater was the percentage reduction in curd tension after processing.

In feeding trials with rats natural soft-curd milk had no tendency to produce larger gains in weight than did normal hard-curd milk or similar milk rendered soft curd by heating or pressure. The average daily consumption of natural soft-curd milk was only slightly greater than that of normal hard-curd milk and much less than that of processed soft-curd milk.

Soft curd character induced in milk by intense sonic vibration, L. A. CHAMBERS (*Jour. Dairy Sci., 19 (1936), No. 1, pp. 29–47, figs. 8*).—This paper reports the results of an investigation of the phenomenon of sonic vibration on the curd tension of milk, together with certain theoretical and practical implications.

Reduction in the curd tension of milk was accomplished by flowing the milk in a thin layer over electromagnetically driven diaphragm sources of intense sonic vibration. The greatest percentage reduction in curd tension was obtained with hard-curd milks, but the final curd values approached a constant level regardless of the original curd texture. No reduction in curd tension was obtained in milk treated below 18° C., and very little at temperatures below the melting point of butterfat. A 360-c oscillator was most efficient when the milk flow was maintained at 250 gal. per hour. With a sound output of about 900 w, more than 50 percent reduction was attained. With this oscillator the degree of reduction bore a direct linear relationship to the power input up to 2,000 w when the velocity was 250 gal. per hour. This

represented an output of about 18 w per 1 percent decrease in curd tension. Other oscillators at different frequencies showed much the same effectiveness with equivalent outputs per unit volume of milk.

A direct relationship existed between the degree of fat dispersion and the degree of curd tension reduction. The increased number of fat particles weakened the curd matrix and increased the adsorptive area on which protein was fixed. A method was devised for producing soft-curd milk by vibration without impairing the final cream volume.

The effect of homogenization on some of the characteristics of milk fat, I. A. GOULD and G. M. TROUT (*Jour. Agr. Res. [U. S.], 52 (1936), No. 1, pp. 49–57, fig. 1*).—The Michigan Experiment Station made a study of the changes in the fat constants of both raw and pasteurized milk prior to and following homogenization. The constants selected for examination were the Reichert-Meissl number, the Polenske number, the acid degree, and the refractive index.

No appreciable differences occurred in these constants when pasteurized milk was homogenized at 1,500 lb. pressure per square inch. When raw milk was homogenized the acid degree (expressed as the number of cubic centimeters of N/1 NaOH per 100 g of fat) increased on an average from 0.572 to 2.608 within a few minutes. The greatest daily change in acid degree of the fat of stored homogenized raw milk occurred during the first 24 hr., when the titration of free acids with N/1 alkali increased on an average from 0.566 to 9.92 cc. Homogenized raw milk stored 5 days required an average of 16.35 cc N/1 alkali to titrate the free acids in 100 g of fat. The measurement of free fatty acids by titration of the fat appeared to be a more accurate and more sensitive means of determining the rate of fat-splitting action than those determinations which may be made upon milk.

Substances adsorbed on the fat globules in cream and their relation to churning.—IV, Factors influencing the composition of the adsorption "membrane", C. E. RIMPILA and L. S. PALMER (*Jour. Dairy Sci., 18 (1935), No. 12, pp. 827–839*).—Continuing these studies (E. S. R., 71, p. 378), the investigation reported deals with the isolation and comparison of the analyses of the fat globule membrane and its protein fraction from artificial emulsions of butterfat in skim milk, buttermilk, whey, and casein solutions, together with analyses of the natural fat globule membrane and its protein fraction.

The percentage of protein and phospholipids in the fat globule membrane from various samples of cream was not constant, but was essentially constant for any one sample of cream after the fourth washing with distilled water, at least through 10 washings. The adsorption membrane formed on butterfat globules emulsified in sweet rennet whey, skim milk, or buttermilk did not have the same composition as the natural fat globule membrane of the milk in its percentage and proportion of protein and phospholipids. The Van Slyke nitrogen distribution of the fat globule membrane proteins from artificial creams prepared by emulsifying butterfat in whey, skim milk, or buttermilk was not the same as that of the natural fat globule membrane proteins.

A large part of the phosphatase activity of natural cream was found in the fat globule membrane material and was not removed by water washing. In the synthesis of milk the natural fat globule membrane was not derived from the milk plasma. The fat globule membrane proteins of natural cream and of artificial creams appeared to contain a prosthetic group, not identified, which caused the nitrogen content to be abnormally low as compared with other known proteins of similar complexity.

Researches on the churning process [trans. title], W. VAN DAM and B. J. HOLWERDA (*Dept. Econ. Zaken [Netherlands], Verslag. Landbouwk. Onderzoek., No. 40 C (1934), pp. 175–213, pl. 1, fig. 1; Eng. abs., pp. 212, 213*).—A study at

the Agricultural Experiment Station, Hoorn, showed that churning caused considerable quantities of liquid fat to leave the fat globules of the cream. The iodine number and refractive index of this buttermilk fat were always higher than those of the butterfat. Cooling the cream to a very low temperature had no influence on this difference in composition, but raising the churning temperature made the difference smaller. It is estimated that not less than 25 percent of the buttermilk fat was derived from the fat globule during churning.

The refractive index of the fat of the very small fat globules of milk was found to be considerably higher and the iodine number slightly higher than that of the fat of the big globules. The refractive indexes of creams obtained by natural creaming and by mechanical separation were the same, but the iodine number of the natural cream was higher. A considerable part of the buttermilk fat was in the colloidal state, so that it was not possible by microscopic examination to determine the number of cream fat globules of the various dimensional groups that passed into the buttermilk during churning.

It appeared that during churning there was a considerable development of the three-phase boundary fat-plasma-air in spite of the presence of proteins, and the butter oil spreading over the air bubbles in the churned mass entered the buttermilk. The increase in quantity of fat in buttermilk which occurred when churning took place at a higher temperature was probably due to overoiling. The very thin denatured films of foam visible through the microscope in skim milk when milk was separated were not observed when cream was churned. They were not observed in separated milk if the colloidal calcium was extracted before separating. The extent and rapidity of the spreading of butterfat over water depended largely upon the treatment to which the fat had been subjected and on the temperature.

Methods of controlling the composition of Oregon butter, G. H. WILSTER (*Oregon Sta. Bul. 338 (1935), pp. 37, figs. 7*).—Continuing a previous study of butter composition (E. S. R., 74, p. 691), methods for the control of the composition of butter are described. These methods are designed for the use of buttermakers and laboratory technicians. The design and construction of apparatus used by the station in the analyses of butter are described. A table shows the amounts of fat in creams of varying fat content, the amount of butter that can be obtained from such cream, and the amount of salt to add to the butter.

Packaging American cheese, W. V. PRICE (*Wisconsin Sta. Res. Bul. 130 (1935), pp. 32, figs. 11*).—This investigation was undertaken to determine the advisability of fast-freezing cured cheese in small packages as a means of modernizing its distribution.

It was found that cured cheese could be fast-frozen and defrosted without injuring the quality of the cheese. Fast-frozen cheese could be held in frozen storage for several weeks without visible deterioration. When defrosted the packages of cheese had to be held at low temperatures in order to inhibit mold growth so that the product could be merchandised successfully. This procedure permits selecting the cheese and packaging at the most desirable stage of ripening so that quality and uniformity can be guaranteed and identified by a brand name. Attractive, sanitary, and convenient sized and shaped packages may be prepared, and there was no waste in this procedure. The process appeared to offer a practical means of overcoming many of the difficulties experienced in cheese distribution.

Studies on the manufacture of Trappist type cheese, J. C. MARQUARDT (*New York State Sta. Bul. 662 (1936), pp. 23, figs. 6; abs. in Farm Res. [New York State Sta.], 2 (1936), No. 3, pp. 9, 13*).—This investigation was undertaken

to study the practical and scientific methods involved in the manufacture of Trappist-type cheese. A review of the literature indicated that the methods of manufacture could be classified into three general groups which are described.

It was found possible to make this type of cheese by several methods. There appeared to be no relationship between the quality of the cheese and the use of special cultures. Humidity control during curing appeared to be one of the most important factors in the proper making of this cheese. Curing was successful at 60° F. or below. Proper curing seemed to be associated with a moisture content of 40 to 45 percent in the cured cheese and 1 to 2.5 percent salt content. A higher salt content retarded or prevented curing. The accepted methods of making this cheese commercially did not give assurance against gritty or bitter cheese. Trappist-type cheese made into a blend by the Geneva method gave a standard flavor and texture with a minimum of failures.

New cheese project started, C. D. KELLY and R. S. BREED (*Farm Res. [New York State Sta.], 2 (1936), No. 3, pp. 1, 11, figs. 4*).—Notes are given describing the leading cheeses of England and Wales.

The age thickening of sweetened condensed milk, II, III, V. C. STEBNITZ and H. H. SOMMER (*Jour. Dairy Sci., 18 (1935), No. 12, pp. 805–810, figs. 3; 19 (1936), No. 1, pp. 55–65, figs. 2*).—This series of investigations at the Wisconsin Experiment Station (E. S. R., 74, p. 844) is continued.

II. *Effect of forewarming conditions.*—This study was undertaken to determine the effect of various forewarming practices upon the subsequent age thickening of the finished product.

Forewarming temperatures of 150° and 165° F. gave a product which thickened less rapidly than heating to only 135°. Temperatures from 180° up to boiling caused the milk to become considerably more unstable, while temperatures above boiling again made the milk less susceptible to age thickening. However, temperatures above boiling gave much darkening in the finished product during storage. Prolonged holding periods at the forewarming temperature tended to unstabilize stable milk, but had a slight effect in stabilizing unstable milk. When sucrose was in contact with the milk during forewarming, it had the greatest effect in causing the milk to thicken during storage. When the sucrose was in contact with the milk only during condensing at 131° the viscosity was greatly reduced, but a more viscous product was produced by adding the sucrose as a sirup near the end of the condensing period. Excessive age thickening could be largely prevented by withholding the sucrose during the time the milk was at the forewarming temperature.

III. *Effect of reaction and changes in the electrical conductivity during manufacture and aging.*—The electrical conductivity and pH concentration were measured during the preparation and aging of several batches of sweetened condensed milk. The different batches varied in their stability toward age thickening.

Increasing the acidity of raw milk caused the sweetened condensed milk to thicken more rapidly during storage, while decreasing the acidity made a more stable product. With unstable milk a change of 0.1 in the pH exerted a marked effect, while with stable milk the effect was not so great. During the storage of sweetened condensed milk at 98.6° F. there was first a slight decrease in pH, followed by a gradual rise of about 0.2 pH, after which it remained fairly constant regardless of whether the milk thickened slowly or rapidly. During the spring unstable milk could be stabilized by the addition of from 60 to 125 g of sodium bicarbonate per 1,000 lb. of raw milk. Sodium bicarbonate was more effective when added to the raw milk than when added to the finished product. The increase in acidity due to forewarming could not be considered an important

factor. Changes in electrical conductivity could not be correlated with the stability of the milk toward age thickening.

Observations on yeasts causing gas in sweetened condensed milk, H. C. OLSON and B. W. HAMMER (*Iowa State Col. Jour. Sci., 10 (1935), No. 1, pp. 37–43, fig. 1*).—The Iowa Experiment Station isolated an oval yeast from each of six samples of gassy sweetened condensed milk. One sample also yielded a spherical type of yeast. The oval type was identified as *Torula lactis-condensi*, the description of which was checked and enlarged. The name *T. globosa* was suggested for the spherical type, which apparently was identical with similar yeasts isolated from the same type of material by other investigators. The differences between these yeasts involved primarily morphology, extent of growth on solid media in the absence of a fermentable material, and growth temperatures.

The data indicated that gas formation in sweetened condensed milk was due to *T. lactis-condensi* or to *T. lactis-condensi* and *T. globosa* growing together, and that when both species were present the former was the more numerous. The failure to produce gas in certain instances when these yeasts were inoculated into cans of normal sweetened condensed milk may have been due to various factors. The cultures may lose their ability to grow in high concentrations of sugar and other materials, and in a viscous material the difficulty of obtaining distribution may be a limiting factor.

Irradiated evaporated milk: The transmission and antirachitic activation of evaporated milk films by ultra-violet radiations, G. C. SUPPLEE, R. C. BENDER, G. E. FLANIGAN, M. J. DOBCAS, and C. E. GREIDER (*Jour. Dairy Sci., 19 (1936), No. 1, pp. 67–79, figs. 6*).—Continuing the study with irradiated milk (E. S. R., 72, p. 683), this investigation with evaporated milk was carried out similarly to that with fluid milk, employing similar methods but taking into consideration the inherent physical differences between the two products.

Irradiation of evaporated milk as such did not result in as high a degree of antirachitic potency as the irradiation of fluid milk when films of the same capacity were subjected to the same intensity and quality of ultraviolet radiation. The films of evaporated milk were thicker and more dense than those of the fluid milk with the same capacity, and hence the depth of penetration of the ultraviolet rays was less. The degree of antirachitic activation was not significantly different from the homogenized and nonhomogenized product, nor was it significantly affected by irradiating at temperatures varying from 55° to 165° F. The ultraviolet-transmitting property of milk was progressively decreased by preheating to 180°, by concentration, and by homogenization. This decrease was due to physical changes in the inherent milk constituents and was independent of density and thickness of milk films. It was possible to increase the antirachitic potency of evaporated milk by exposure of thinner films for longer periods of time or by increasing the intensity of the incident radiation. However, the potency obtained was not equal to that obtained by the irradiation of fluid milk films treated under comparable conditions.

The effect of process of manufacture on the vitamin G content of dried skim milk, H. J. DAVIS and L. C. NORRIS (*Jour. Dairy Sci., 19 (1936), No. 1, pp. 1–10*).—The [New York] Cornell Experiment Station reports the results of a study of the effect on the vitamin G content of drying skim milk under normal conditions and by various methods.

There was no significant destruction of the growth-promoting component of the vitamin G complex contained in skim milk when dried by the Merrell-Soule spray process, the Gray-Jensen spray process, or the open-roller process. No

measurable destruction of vitamin G occurred as a result of holding liquid skim milk in storage tanks at 170° F. for from 18 to 23 hr. previous to drying, or of slightly scorching the milk powder during the drying process, or of neutralizing sour skim milk previous to drying. When enough alkali was added to bring the pH to approximately 9.5 or the titratable alkalinity to 0.15 percent, a slight destruction of vitamin G seemed to take place.

The solubility-freezing point relationships of water solutions saturated with respect to sucrose and dextrose in relation to the storage of sherbet and water ice, A. Leighton and A. Leviton (*Jour. Dairy Sci., 18 (1935), No. 12, pp. 801–803, fig. 1*).—Work was undertaken by the U. S. D. A. Bureau of Dairy Industry to determine the exact solubility and freezing point relationships of water solutions saturated to sucrose and dextrose. The ternary eutectic temperature of the system sucrose-dextrose-water was —17.9° C., and the proportion of dextrose to sucrose was 1 to 4.11 parts. This was a markedly lower proportion of dextrose to sucrose than that indicated as permissible in practice. It is concluded on the basis of these results that in practice a certain degree of supersaturation was permissible.

VETERINARY MEDICINE

History of the School of Veterinary Medicine of the University of Pennsylvania, 1884–1934 (*Philadelphia: Vet. Alumni Soc., 1935, pp. [6]+226, pls. 25*).—A compilation by the faculty in commemoration of the fiftieth anniversary of the school's founding.

Theobald Smith on disease, M. C. Hall (*Jour. Heredity, 26 (1935), No. 10, pp. 419–422*).—A review of the work on parasitism and disease previously noted (E. S. R., 72, p. 249).

[Report of work in animal pathology and bacteriology by the Colorado Station] (*Colorado Sta. Rpt. 1935, pp. 14, 31–33*).—The work of the year reported (E. S. R., 72, p. 837) relates to losses of livestock due to poisoning by timber vetch (*Astragalus campestris*), losses of lambs caused by *Clostridium welchii* and by the sheep coccidium *Eimeria faurei*, infectious abortion, anaplasmosis, icterohematuria, and the toxicity of thallium sulfate for cattle.

[Report of work in animal diseases at the Storrs Station, 1935] ([*Connecticut*] *Storrs Sta. Bul. 207 (1935), pp. 9–20*).—In reporting briefly on the work of the year with infectious abortion, reference is made to the establishment and maintenance of abortion-free herds by periodic blood testing and complete segregation of nonreacting animals and disposal of reactors, and to microbic dissociation in the abortus-melitensis group. The work on infectious mastitis dealt with the characteristics of streptococci of bovine origin, a comparison of diagnostic methods to the end that a reliable means of detecting carriers may be selected or devised, and the development of a system of control through segregation of infected animals, a description of which has been noted (E. S. R., 73, p. 104). Brief reference is made to work on infectious tracheitis and allied respiratory diseases of poultry and to coccidiosis and fowl paralysis; to studies of sheep parasitoses of economic importance in Connecticut, as shown by fecal examination; and to a survey of horse and poultry diseases occurring in Connecticut based upon laboratory diagnosis.

Diseases of animals: Prevention and treatment, F. C. Minett (*Jour. Roy. Agr. Soc. England, 95 (1934), pp. 196–217*).—Hog cholera (including survival within the pig carcasses, survival outside the body, and disinfection), survival of tubercle bacilli on pasture, and mastitis in cattle, by Minett, and diseases of sheep caused by anaerobic bacteria, namely, braxy or bradsot, gas gangrene,

struck, and lamb dysentery, by A. D. McEwen, are presented with a list of 24 references to the literature.

[Work with animal diseases and parasites in the Philippine Islands] (*Natl. Res. Council Philippine Isl. Rpt., 1 (1935), pp. 334–348, 486–491*).—Accounts are given of the history of veterinary medicine and parasitology in the Philippines as follows: Early History of Veterinary Science in the Philippine Islands, by V. Ferriols (pp. 334–339); The Development of Veterinary Medicine in the Philippines, by A. K. Gomez (pp. 340–343); History of Animal Pests and Diseases in the Philippines, by T. Topacio (pp. 344–348); and Medical and Veterinary Parasitology in the Philippines: Solved and Unsolved Problems, by M. Tubangui (pp. 486–491).

The staining and microscopical demonstration of filterable viruses, A. C. COLES (*Jour. Roy. Micros. Soc., 55 (1935), No. 4, pp. 249–255*).—The equipment and technic are considered at some length.

On the preservation of the abortus-bacillus in water, E. HENRICSSON (*Skand. Vet. Tidskr., 26 (1936), No. 2, pp. 57–61; Eng. abs., p. 61*).—The author reports having confirmed earlier findings (E. S. R., 69, p. 266) that *Brucella abortus* can be spread by drinking water and along waterways. It is shown that abortion bacilli remain viable not only in sea water but also in water fouled by colon bacilli (2,000 to 20,000 per liter) at various temperatures.

The effect of diet on the coccidian infection of the rat, E. R. BECKER and N. F. MORRHOUSE (*Jour. Parasitol., 22 (1936), No. 1, pp. 60–67*).—In studies by the authors, a vitamin A-deficient ration did not exert any modifying influence on the course of experimental coccidiosis when *Eimeria miyairi* was the parasite and the white rat was the host.

"A vitamin B- and vitamin G-deficient ration produced a very significant lessening of the number of oocysts eliminated during the period of immunization. (Further work is being undertaken in order to determine which vitamin was responsible for this result.) More oocysts were eliminated by rats on a vitamin D-deficient ration than by the controls, but the results are not statistically significant. A diet generally deficient in vitamins, proteins, and salts did not lower the host's resistance to the coccidian infection. A high casein diet seemed to exert a slight limiting effect on the development of the coccidian population, but further work will be necessary to definitely establish this indicated result as a fact.

"A diet of liver only did not affect the experimental course of the infection. Yeast and irradiated yeast supplements to a normal or growing ration did not limit oocyst production. Desiccation of the host's tissues by depriving it of water did not alter the course of the infection. Low and high salt diets did not affect the quantitative character of the infection. Alfalfa and tobacco supplements to the ration neither increased nor decreased the number of oocysts eliminated."

Studies on the bactericidal action of bovine whole blood and serum towards Brucella abortus and Brucella suis, M. R. IRWIN, B. A. BEACH, and F. N. BELL (*Jour. Infect. Diseases, 58 (1936), No. 1, pp. 15–22*).—In work at the Wisconsin Experiment Station, conducted in cooperation with the U. S. D. A. Bureau of Animal Industry, the authors have found that "bovine serum normally contains bactericidins for *B. abortus*. Whole blood shows a bactericidal effect slightly less than comparable amounts of serum alone. Individual animals show uniformity in reaction at different times, with a difference between animals in bactericidal activity. Certain animals, recovered from a previous infection of *B. abortus*, showed a loss in bactericidal properties of the whole blood as compared to that of presumably normal animals. Bovine whole blood

exerted no bactericidal effect on *B. suis;* the reaction of serum for this organism was decidedly less marked than for *B. abortus.*"

Studies on the extraction of a precipitable substance from the genus Brucella, D. O. REITER (*Jour. Infect. Diseases, 58 (1936), No. 1, pp. 45–58*).—Specific precipitable substances of polysaccharide nature were prepared by the author from the three varieties of the genus *Brucella* by saline extraction, followed by precipitation with alcohol. These substances were feebly antigenic in rabbits but failed to give any of the usual chemical tests for proteins, with the exception that under certain conditions the substance from two strains gave a doubtfully positive biuret test. "The specific substance from the [*B.*] *abortus* strain caused a typical anaphylactic reaction in a guinea pig when 15 mg was used as a sensitizing dose. The specific substance from the [*B*] *melitensis* and the porcine strains failed to give a typical reaction. The preparations from the three varieties precipitated *Brucella* antiserums, but did not precipitate heterologous serums from the *Salmonella* group. Serums absorbed with the precipitable substances from the three varieties showed a considerable reduction in the agglutinating titer of both homologous and heterologous *Brucella* antiserums, indicating that the differences observed in the specific precipitable substances from the three strains may be quantitative rather than qualitative."

Comparative observations on streptococci from human gastro-intestinal ulcerations and from bovine mastitis, J. C. TOBREY and E. MONTU (*Jour. Infect. Diseases, 58 (1936), No. 1, pp. 105–114*).—A report is given of a comparative study made of authentic strains of the Bargen diplostreptococcus of ulcerative colitis, of selected enterococci associated with the same disease, of representative strains of Saunders *Streptococcus* of gastroduodenal ulcers, and of streptococci associated with bovine mastitis.

"Biochemical and serological tests indicated only exceptionally any relationship between the streptococci associated with ulcerative processes in the human gastrointestinal tract and the *S. mastitidis* of bovine origin. On the other hand, three streptococcal strains from mastitis milk not related culturally or serologically to *S. mastitidis* exhibited such relationships to two enterococcus strains from ulcerative colitis and to certain of the Saunders peptic ulcer and carcinoma strains. These and other findings suggest a bovine origin for certain enterococcuslike organisms capable of invading human tissues."

A check-list and host-index of the genus Haemoproteus, G. R. COATNEY (*Jour. Parasitol., 22 (1936), No. 1, pp. 88–105*).—A check list of 45 known species of the genus *Haemoproteus* and a host index are accompanied by a three-page list of references to the literature cited.

Resistance of streptococci to pasteurization, R. S. BREED ET AL. (*Amer. Pub. Health Assoc. Yearbook, 1933–34, pp. 67–71*).—This is a report of the committee on milk pasteurization studies of the American Public Health Association presented on October 9, 1933, in which the details of heat-resistance tests of several forms, including *Streptococcus mastitidis, S. pyogenes,* and others, are given in tables, together with a list of 10 references to the literature.

Studies on surra.—IV, Variability in size of the trypanosomes and density of infection, natural and acquired immunity, M. MANRESA and B. M. GONZALEZ (*Philippine Agr., 24 (1936), No. 9, pp. 716–751, figs. 3*).—This further report of studies (E. S. R., 74, p. 259) is presented with a list of 17 references to the literature, the details of the work conducted being given in tables.

Anaplasmosis transmission by three species of ticks in California, W. H. BOYNTON, W. B. HERMS, D. E. HOWELL, and G. M. WOODS (*Jour. Amer. Vet. Med. Assoc., 88 (1936), No. 4, pp. 500–502*).—In the first of the four cases reported, *Dermacentor andersoni* Stiles was found to be a vector of anaplasmosis,

confirming the findings of Rees (E. S. R., 67, p. 597; 69, p. 269; 71, p. 694). Two of the cases reported incriminate the Pacific coast tick and demonstrate for the first time in the United States, it is believed, that there is a definite biological transmission of the disease. In the fourth case the winter tick was demonstrated to be an agent of mechanical transmission of anaplasmosis.

Transmission of relapsing fever by ticks in Palestine, S. ADLER, O. THEODOR, and H. SCHIEBER (*Lancet [London], 1936, I, No. 8, p. 448*).—It is pointed out that the fowl tick is widely disseminated in Palestine but wrongly suspected, since in a recent outbreak of relapsing fever in Kfar Vitkin, south of Hedera in the coastal plain, the cave-infesting *Ornithodoros papillipes* was found to be the vector.

The development of trichinae in abnormal environments, O. R. MCCOY (*Jour. Parasitol., 22 (1936), No. 1, pp. 54–59*).—It was found in experiments conducted that when sterile larvae of *Trichinella spiralis* were injected into the membranes of living chick embryos or into the amniotic sacs of rat embryos, a small percentage of them developed to the adult stage. "The rate of growth in rat embryos was the same as in the normal intestinal environment, but in chick embryos it was somewhat retarded. Development of trichinae also occurred in the lumen of the uteri of pregnant rats, but when larvae were injected into nonpregnant uteri they were rapidly killed. In a few animals it appeared that normal migration of young trichinae to the muscles of the mother rat took place from female worms which had developed in the uterus. A small series of female rats showing intestinal immunity to a second infection with *Trichinella* larvae given by mouth failed to manifest any significant immunity in the uterus."

An investigation of plants poisonous to stock in Western Australia, H. W. BENNETTS (*Jour. Dept. Agr. West. Austral., 2. ser., 12 (1935), No. 4, pp. 431–441*).—The results of an investigation of the toxicity of suspected plants in Western Australia for sheep, conducted from August to December 1934, are reported upon.

Sudan grass and other cyanophoric plants as animal intoxicants.—A preliminary report, C. F. ROGERS and W. L. BOYD (*Jour. Amer. Vet. Med. Assoc., 88 (1936), No. 4, pp. 489–499*).—In reporting the results of work at the Minnesota Experiment Station, the details of experimental feeding of cyanophoric and suspected "poisonous" feeds and a summary of tests from 1932 to 1935, inclusive, of materials received in cases of poisoning, etc., are given in tables.

Studies on the antiseptic action of garlic, M. KITAGAWA and A. AMANO (*Bul. Sci. Fakult. Terkult., Kjusu Imp. Univ., Fukuoka, Japan, 6 (1935), No. 4, pp. 299–305; Eng. abs., p. 305*).—Garlic was shown to contain a strong antiseptic substance identified with a mixture of alkyl sulfides, it being produced from glucosides by the action of garlic ferment. "The antiseptic action of garlic was due to the unstable sulfur contained in alkyl polysulfide molecule of garlic."

Effect of hydrochloric acid injection on the number of leucocytes in the blood, E. H. BARGER (*Vet. Med., 31 (1936), No. 2, pp. 64, 65*).—As judged by the standard of leucocyte and differential counts, no apparent leucocytosis was induced in either a group of heifers or a group of mature lactating cows by the intravenous injection of a sterile dilute (1–1,500 volumetric) aqueous solution of hydrochloric acid. If a leucocytosis was induced in any of the animals, it did not persist for as long as 48 hr. In no instance was there any clinical manifestation of illness during the observation, nor was milk production disturbed.

The effect of flies and fly sprays on certain physiological processes of the dairy cow, W. M. REGAN and S. B. FREEBORN (*Jour. Dairy Sci., 19 (1936), No. 1, pp. 11–28, fig. 1*).—In studies in California, commenced in 1925, it was found that when high-producing cows were exposed to extremely heavy infestations the loss in milk production occasioned by houseflies and horn flies was negligible, while that caused by stableflies was slightly less than 10 percent.

Fly sprays of petroleum oils carrying pyrethrum or pine oil or both had the same repellent efficiency for the first hour but differed at subsequent intervals, pine oil increasing the efficiency in proportion to the amount added.

"Burning of the skin followed the use of oils having a viscosity lower than 40 sec., irrespective of the unsulfonated residues; while oils with unsulfonated residues below 90 percent were dangerous, when used in oils of higher viscosity than 65 sec. When the petroleum sprays were used to repel the stableflies, the loss in milk yield was increased to 22 percent. The extreme effect was evident when high-producing cows were sprayed during hot weather. Not only was production diminished but the body temperature and respiration rate were elevated. Dry cows exhibited no increase in temperature or breathing rate when sprayed. The application of oil produces on the skin a definite physiological effect, impairing its ability to aid in maintaining body temperature. The hourly loss of water through the skin of the unsprayed cow at 84° F. and 60 percent relative humidity was 413 g, while for the sprayed animal this figure was 223 g. This represents a loss of 46 percent in cooling, due to the loss in evaporation of water from the skin. When 40 cc of commercial spray was applied at an environmental temperature of 80°, the upper critical temperature or 'pyrexial point' of the cow was lowered approximately 5°.

"A water emulsion of pyrethrum and pine oil combined with a small amount of petroleum was as efficient in repelling flies as the petroleum sprays and was less detrimental to the cows."

Bang's disease: The economics of some aspects of this disease in dairy cows, A. GOW, JR., and A. B. HAMILTON (*Maryland Sta. Bul. 387 (1935), pp. 391–394*).—The results of a study of the economic loss from Bang's disease in six herds selected in February 1931 and three additional herds selected in 1932 are reported upon, the details of the work for each year and the average for the 4 yr. being given in table form.

In 1931 the difference in returns in favor of the noninfected group of cows was $40.08 per cow, in 1932 it was $24.82, and in 1933 it was $18.35, while in 1934 the infected group returned 36 ct. more per cow than the noninfected group. The average for the 4 yr. was $22.35 greater per cow for the noninfected group. The gain was due to the greater milk and butterfat production and to the better yield of calves. The milk production for the noninfected cows during the 4-yr. period averaged 6,844 lb. per year with a butterfat content of 281.6 lb., in comparison with 6,330 lb. of milk and 251.6 lb. of fat for each positive cow. The calvings averaged 1.07 per cow-year in the noninfected group and 0.86 per cow-year for the infected group.

The relation of blood and milk sera agglutination titres to udder infection in Bang's disease, C. L. EVERSON, L. J. POELMA, and A. L. BRUECKNER (*Maryland Sta. Bul. 387 (1935), pp. 395–400*).—In the work reported, in which the blood serum agglutination titer was used as a basis, milk samples were drawn (1) from 382 cows showing a blood serum agglutination titer of 1:200 or above, of which 176, or 46.1 percent, proved positive for *Brucella abortus* upon guinea pig inoculation; (2) from 63 cows showing a blood serum agglutination titer of 1:100, of which 8, or 12.7 percent, were found to be positive for *B. abortus;* (3) from 191 cows showing a blood serum agglutination titer under

1:100, of which 6, or 3.1 percent, proved positive for *B. abortus;* and (4) from 78 cows which were negative to the blood test and the animal inoculation of their milk.

"Of the 6 animals which showed udder infection and whose blood serum agglutination titer was under 1:100, available records show that the agglutination titer of each of these animals was either on the increase or decrease at the time the milk sample was obtained.

"Using the milk serum agglutination titer as a basis, there were milk samples drawn from 175 cows which showed an agglutination titer of 1:200 or above, of which 119, or 68 percent, proved positive for *B. abortus* on guinea pig inoculation; from 78 cows whose milk showed an agglutination titer of 1:100, of which 30, or 38.4 percent, proved positive for *B. abortus;* from 98 cows whose milk titer was under 1:100, of which 24, or 24.5 percent, proved positive for *B. abortus;* and from 247 cows whose milk sera were negative to the agglutination test, of which 14, or 5.6 percent, were positive for *B. abortus.*

"Comparing the reactions on the basis of blood serum and milk serum agglutination titers, there is shown a greater percentage of positive results based upon milk serum titers. However, using the milk agglutination titer as a means of eradication would be uncertain, since 5.6 percent of those animals which did not have agglutinins in their milk serum were found to harbor the Bang organism in the udder."

An accompanying table shows the results on the basis of blood serum agglutination titers, each in combination with like milk serum agglutination titers and with udder secretion which was not suitable for an agglutination test.

It is pointed out in conclusion that (1) a high milk serum agglutination titer was more indicative of udder infection than was a high blood serum titer, (2) milk serum negative for the agglutination test did not indicate freedom from udder infection, and (3) *B. abortus* organisms were not found in the milk from any cow whose blood serum did not show agglutinins.

The clinical treatment of retained corpus luteum in the cow, C. F. CLARK (*Vet. Med., 30 (1935), No. 12, pp. 536–538; abs. in Michigan Sta. Quart Bul., 18 (1936), No. 3, p. 200*).—Information compiled from a series of 292 cases of sterility which were treated clinically is reported, including in tabular form the details of 62 that were diagnosed as having a retention of the corpus luteum with no other associated abnormalities. The records indicate that in those cases in which only a retention of the corpus luteum produced sterility the treatment outlined was beneficial. Following treatment, heat periods recurred, the ovaries were not injured by the treatment, and conception followed in a rather high percentage of cases.

The diagnosis of mastitis, L. E. STARR, T. H. PRESCOTT, and J. HUFFMAN (*Jour. Amer. Vet. Med. Assoc., 88 (1936), No. 4, pp. 468–474*).—Comparative diagnostic tests conducted in the Virginia Experiment Station herd have led to the conclusion that the physical examination compares very favorably with other methods in the diagnosis of mastitis. Bromocresol purple-impregnated paper is considered especially valuable, when used in conjunction with the physical examination. The strip-cup and rennet tests are simple and reliable for use by the dairyman, but chlorine and catalase are too sensitive and should only be used as a laboratory procedure. The H-ion concentration of the milk is not reliable as a diagnostic agent for mastitis. The bacteriological examination is particularly applicable to board of health and research work, but is too complicated and expensive for routine mastitis control.

The effect of streptococcic mastitis on the methylene blue reduction test, E. D. DEVEREUX and C. S. BEYAN (*Michigan Sta. Quart. Bul., 18 (1936), No. 3, pp. 161–163*).—The authors found that in many instances the methylene blue reduction time of milk was significantly altered by the presence of milk from mastitis-infected animals. In some instances the quality of milk was significantly altered, as measured by the reduction test, when only 10 percent of the milk in question was from mastitis-infected animals. It is suggested by this preliminary work that the leucocytes present in milk from mastitis-infected animals are largely responsible for classifying as poor milk by the reduction test milk so constituted.

Experimental Trichomonas foetus infection in sheep, J. ANDREWS and C. W. REES (*Jour. Parasitol., 22 (1936), No. 1, p. 108*).—In this brief note the authors report that five nonpregnant ewes injected intravaginally with vaginal washings from a heifer infected with *T. foetus* (Riedm.) all became infected within 5 days. They remained irregularly positive for over 5 mo. to date of writing.

The present status of equine encephalomyelitis in the United States of America, J. R. MOHLER (*North Amer. Vet., 17 (1936), No. 1, pp. 34–38*).—A summary of the present knowledge of equine encephalomyelitis in the United States.

Cornstalk disease investigations—toxic encephalitis or non-virus encephalomyelitis of horses, R. GRAHAM (*Vet. Med., 31 (1936), No. 2, pp. 46–50, figs. 5*).—In observations made during the 1934–35 outbreak of so-called cornstalk disease in Illinois, which resulted in a loss of some 5,000 horses in the central part of the State, the syndrome in naturally affected horses pointed to a disturbance of the brain and cord with three clinical types of the disease, including the lethargic, nervous, and paralytic, as observed in the virus type of encephalomyelitis.

"No evidence of a virus or viruslike agent was found by animal inoculation, including intracerebral and footpad inoculation of more than 50 brain specimens into guinea pigs, mice, pigeons, rabbits, and horses. The disease was experimentally reproduced in 1 and possibly 2 horses turned in a 55-acre cornfield, although the feeding of damaged corn to 8 horses in the stalls did not produce the disease. Sixty-five percent of the brains of natural cases of the disease showed areas of gross degeneration varying from 0.5 cm to an area involving one-fourth or one-half of the cerebral hemisphere. The histopathological changes involved perivascular edema, hemorrhage, and degenerative changes in the nerve cells. A variety of bacteria were isolated from the brains of horses, including streptococci, diplococci, staphylococci, *E[scherichia] coli*, and *Pasteurella*-like micro-organisms, as well as several types of molds."

Fistulous withers and poll-evil due to Brucella abortus, H. M. M. DUFF (*Vet. Rec., 16 (1936), No. 7, pp. 175–177*).—In the course of the last 3 yr. the author examined 85 samples of material from unopened cases of fistulous withers and poll evil in horses. From 68 of these animals, *B. abortus* was isolated either by direct culture or by guinea pig inoculation. In most cases the organism was in pure culture. Of the 85 samples, 73 were from fistulous withers, 8 from poll evil, and 4 from horses suffering from both conditions. Sixty of the withers samples, 4 of the poll samples, and all of those from cases of both fistulous withers and poll evil were positive to *B. abortus*.

Microfilarial infestation in the skin of a horse, J. E. ALICATA (*North Amer. Vet., 17 (1936), No. 1, pp. 39–41, figs. 2*).—Microfilariae morphologically identical with those reported by Underwood in 1934 (E. S. R., 71, p. 538) from the skin of horses affected with equine dhobie itch in the Philippine Islands and Texas were recovered at Fort Myer, Va., from skin lesions of the abdomen,

the neck, and the fore and hind legs of a horse, the ligamentum nuchae of which contained a large number of *Onchocerca reticulata* (*O. cervicalis*), of which they are thought to be a developmental stage. See also another note (E. S. R., 74, p. 699).

Results of poultry disease studies at the University of California for 1935, J. R. BEACH (*Nulaid News, 13 (1936), No. 11, pp. 36, 37, fig. 1*).—The progress of work with fowl pox, infectious coryza or colds due to *Hemophilus gallinarum*, infectious laryngotracheitis, pullorum disease, neurolymphomatosis (paralysis), pullet mortality, and chronic coccidiosis is referred to in this brief account.

Attempts to differentiate between Bacterium gallinarum Klein and B. pullorum Rettger by means of bacteriophage [trans. title], P. M. N. NAIDU (*Bul. Acad. Vét. France, 8 (1935), No. 6, pp. 306–311; abs. in Vet. Rec., 16 (1936), No. 6, p. 150*).—The author has found it possible to differentiate between *B. pullorum* and *B. gallinarum* by means of bacteriophage.

Some observations on the presence in laying pullets of the parasite causing coccidiosis in young chickens, J. A. DAVIDSON, W. T. THOMPSON, and J. M. MOORE (*Michigan Sta. Quart. Bul., 18 (1936), No. 3, pp. 178–182*).—This is a first-year or preliminary report of observations of 100 birds housed in each of 2 similar 20- by 20-ft. pens, the details of which are presented in tables. The mortality was heavier by 23 birds in the positive pen. The birds in the negative pen laid 15.2 eggs more per bird and weighed 0.44 lb. more per bird.

Transmission studies in leucemia, F. THORP, Jr., and R. GRAHAM (*Vet. Med., 31 (1936), No. 2, pp. 82–85, figs. 2*).—In the infection experiments reported leukemia or a leukemia-like disease was reproduced in healthy chickens following intravenous and subcutaneous injections of whole blood, some blood constituents, and tissue suspensions, as well as by feeding feces and by contact with contaminated soil.

"The incidence of the disease following artificial exposure was relatively low. Only 24 cases developed in inoculated fowls or fowls exposed by feeding feces, while 11 of the controls developed natural cases of leukemia from unknown sources. External and internal parasites as well as coccidia were observed in some pens of the experimental fowls."

Details of the inoculation work are summarized in a table.

On the control of tapeworm infestation in chickens, with notes on the pathology of the intestines of the hosts, H. J. STAFSETH (*Michigan Sta. Tech. Bul. 148 (1935), pp. 46, figs. 9*).—The experimental treatment for the control of tapeworms of poultry, the details of which work are given in 12 tables, has shown that while iodine vermicide, a colloidal iodine preparation, is highly effective in removing the bodies (strobilae), comparatively few heads (scoleces) are removed. The fact that it kills a large number of onchospheres besides removing the exposed strobilae is considered to justify its use in the control of tapeworm infestation on the ground that it breaks the cycle of development of tapeworms and thus prevents spread for a considerable length of time. "All *Ascaridia* and strobilae of tapeworms reached by the iodine were killed and expelled. However, considerable numbers of young *Ascaridia* may be situated so deeply in the cysts of the mucosa as to escape the effects of the iodine. These can all be removed by a second treatment when sufficient time is allowed for their development and passage into the lumen of the intestine. In vitro tests are recorded to add further proof to the killing power of colloidal iodine on nematodes and tapeworms. The majority of onchospheres contained in proglottides acted upon by colloidal iodine in vivo as well as in vitro were killed. In a certain number of birds the iodine is destroyed rather quickly after it reaches the small intestines. Tapeworms and their scoleces were made

visible in the deeper layers of the mucous membrane by fixing, washing, dehydrating, and then clearing compressed pieces of intestine in benzyl benzoate.

"*Raillietina cesticillus* and *Hymenolepis carioca* were shown to be the commonest tapeworms in this locality and to produce pathological conditions such as catarrhal enteritis, capillary congestion, lymphocyte, polymorphonuclear, and eosinophile cell infiltration, proliferation of epithelium, and fibrosis. Some red bodies are described as occurring in the stroma of the mucous membrane as well as in the epithelium. They were also observed in the digestive tract of nematodes."

Studies on incubator hygiene.—V, A note on the hatchability of eggs inoculated with Salmonella, Pasteurella, staphylococci, and streptococci, R. GRAHAM and V. M. MICHAEL (*Poultry Sci., 15 (1936), No. 1, pp. 83–87*).—In continuation of these studies (E. S. R., 74, p. 856), the hatchability of eggs inoculated with 3 mm³ of an 0.85 percent sodium chloride suspension of *S. pullorum*, *S. aertrycke*, *S. gallinarum*, *P. avicida*, and two strains of staphylococci was seriously impaired, but was only slightly decreased by inoculation with three strains of streptococci. The strains of staphylococci and streptococci used for inoculation were isolated from eggs of apparently healthy hens. When 0.85 percent sterile sodium chloride and a suspension of micro-organisms made in 0.85 percent sodium chloride was introduced into the eggs by means of puncturing the side, it appeared to have a more detrimental effect upon the hatchability than the same material injected into the air cell.

An outbreak of acute swine erysipelas infection in turkeys, F. R. BEAUDETTE and C. B. HUDSON (*Jour. Amer. Vet. Med. Assoc., 88 (1936), No. 4, pp. 475–487*).—Contributing from the New Jersey Experiment Stations, a report is made of an outbreak of disease that appeared in a flock of about 500 turkeys in Hunterdon County and killed over 200 in a period of 9 days. Cultures taken from 23 of 24 birds autopsied yielded the same organism in each case. Morphologically, culturally, and biochemically it was indistinguishable from the true swine erysipelas organism (*Erysipelothrix rhusiopathiae*). The organism was pathogenic for mice and chickens by subcutaneous inoculation, and pigeons were infected by intranasal inoculation but not by ingestion. There were no agglutinins in the blood serum of 20 recovered turkeys tested, and the organism could not be recovered from the nasal cavity of these birds.

Studies on some trichomonad flagellates from birds, with descriptions of five new species and two new varieties, B. V. TRAVIS (*Iowa State Col. Jour. Sci., 10 (1936), No. 2, pp. 115–128, figs. 19*).—Descriptions of five new species and two new varieties and records of new hosts for three other species are included in this contribution from the Iowa Experiment Station.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Colorado Station] (*Colorado Sta. Rpt. 1935, pp. 7, 8, 17–19, 27–30*).—Progress results are briefly presented of investigations on oil-gravel mixtures for road surfaces, sugar beet machinery, critical periods in the use of irrigation water, irrigation equipment, and pumping for irrigation.

[Agricultural engineering investigations by the Nebraska Station] (*Nebraska Sta. Rpt. [1935], pp. 5–7, 54*).—Progress results are briefly presented on investigations of pneumatic tires for farm tractors, heating water for livestock, insulated electric brooders in uninsulated poultry houses, bindweed eradication machinery, and irrigation pumping.

Influence of two secondary factors in weir measurements, C. W. HARRIS (*Wash. Engin. Expt. Sta. Bul. 81 (1935), pp. 14, figs. 3*).—Studies are reported

which demonstrate the need of more careful thought concerning the source of experimental data from which weir coefficients are deduced. First, side-wall extensions are shown to be essential if a coefficient is to remain constant with varying length; second, the cause of departure from the theoretical coefficient as the head decreases is traced to viscous drag. The amount of departure, in the case of a liquid of such low viscosity as water, is found to be proportional to the viscosity.

Erosion control with the S. E. R. A., F. W. HAASIS (*Soil Sci., 41 (1936), No. 3, pp. 231–238, figs. 2*).—The results of a survey of about one-third of the area of a "supervisorial" district in Monterey County, Calif., "afford little basis for correlating erosion with soil, slope, or cover conditions, except that with a timber or brush cover erosion was inappreciable. On more than half the farms visited, erosion was noted, serious erosion on one-fifth of them. On one-fourth, some sort of control was practiced by the owner. On one-seventh, land use had been reduced because of erosion. Ill-advised farm management is responsible for much of the erosion observed.

"The control measures included building of approximately 200 dams and other structures, largely of willow; planting willow and sea fig; laying drain pipe; and digging diversion ditches. It was not possible within the limitations of an S. E. R. A. project to undertake a complete treatment of the erosion problem in the district, but the measures taken appear to be effective as far as they go."

Design of earth fill dams, W. W. WYCKOFF (*Jour. Amer. Water Works Assoc., 28 (1936), No. 1, pp. 127–133, figs. 4*).—Basic principles of design are enumerated and discussed, these relating primarily to structural stability and imperviousness.

Soil compaction control for rolled earth dam construction, R. R. PROCTOR (*Jour. Amer. Water Works Assoc., 28 (1936), No. 1, pp. 134–141, figs. 6*).—Testing procedure is described together with typical test results which bring out the fact that saturated plasticity of the compacted soil is much more important than watertightness alone. From these tests the plasticity needle test was developed. The needle is used to measure the plasticity of the experimentally compacted specimens, and, with such results available for a particular soil, the moisture content of the soil can be found by compacting it in a container, measuring the penetration resistance, and referring to the penetration resistance curves that had been previously prepared. This probably is the most important single use of the needle, as it enables the quick determination of soil moisture content in the field without the delay caused by the slowness of oven drying. The entire test requires about 2 min.

The longitudinal variation of timber during seasoning, II, M. B. WELCH (*Roy. Soc. N. S. Wales, Jour. and Proc., 68 (1934), pp. 249–254*).—An examination is reported of the longitudinal variation of some 300 samples of a large number of different woods in relation to their densities. It was found that while 66 percent of the total samples swelled or remained stationary during drying from a green condition to the fiber saturation point, only 33 percent behaved similarly from the fiber saturation point to an air-dry condition. In general, woods of low density showed the greatest tendency to swell, and heavy woods were more prone to remain stationary during the initial drying period. Below the fiber saturation point light timbers showed the greatest liability to shrinkage, and heavy woods were inclined to remain stationary or to swell. In a number of timbers the longitudinal movements were irregular, expansion and contraction occurring several times during seasoning—an indication that length is not always a function of the moisture content of the wood.

It is suggested that severe internal compressive stresses resulting from the shrinkage of the outer part of the wood may be responsible for the elongation or longitudinal swelling during seasoning.

Strength tests of structural timbers.—I, General principles with data on redwood from gefle and archangel, C. J. CHAPLIN and J. LATHAM ([*Gt. Brit.*] *Dept. Sci. and Indus. Res., Forest Prod. Res. Rec. 2 (1935), pp.* [2]+*10*).—The general principles of these tests are presented and discussed and their practical application demonstrated.

The testing of timbers at the Forest Products Research Laboratory ([*Gt. Brit.*] *Dept. Sci. and Indus. Res., Forest Prod. Res. Rec. 1 (1935), pp.* [2]+*8, figs. 2*).—The purpose of this publication is to explain the character and scope of the timber-testing work of the laboratory and to demonstrate the practical advantages thereof.

Exposure test on repainting wood surfaces (*Oil, Paint, and Drug Rptr., 128 (1935), No. 22, pp. 58–60, figs. 4*).—Repainting tests on fences painted in 1931, conducted by the U. S. D. A. Forest Service in cooperation with several private commercial paint agencies, are reported. The tests were started in 1935 and only preliminary results were available.

Very definite differences in the characteristics of the old coatings of white lead, lead-and-zinc, and titanox-and-zinc paints were observable during the application of the first coats of new paint.

The old coating of white lead paint on the south side of the fence was much softer than either of the other two paints, and for that reason had to be sandpapered very lightly to keep from removing the old coating entirely. On the north side of the fence the white lead paint was harder than it was on the south side, but was softer than the other two paints on the north side These differences in hardness were paralleled closely by differences in absorptiveness for the new paint or for the oil of the new paint. On the south side of the test fence the painters could feel the greater suction of the old white lead paint very distinctly as they brushed on the new paint. On the north side there was much less difference between the paints in this respect.

After the first coats of new paint were dry the differences in absorptiveness of the old coatings were reflected in the degree of gloss of the new ones. On the south side of the fence all first coats of paint dried without gloss over old white lead paint, except where aluminum priming paint had been used under the white lead paint. The attempts to repaint the white lead paint with one coat instead of two coats were not satisfactory on the south side for this reason. Over the old lead-and-zinc and titanox-and-zinc paints on the south side the first repaint coats dried with a good uniform gloss. Where aluminum priming paint had been used the gloss was observably greater than elsewhere. The one-coat repaint jobs over the harder paints were satisfactory from the point of view of hiding power and uniform gloss.

The production and marketing of cornstalk insulation board ([*Ames*]*: Iowa State Planning Bd., 1935. pp.* [*20*], [*figs. 5*]).—This mimeographed report discusses the properties of insulation materials made from cornstalks, the applications, benefits, and selection of such materials, the location and size of specific insulation markets, and the economic factors in processing cornstalks.

Bibliography on natural and pozzolanic blended cements and related subjects, S. P. WING (*Denver, Colo.: U. S. Bur. Reclam., 1934, pp. 63*).—This working bibliography has been compiled for the purpose of investigating the possibilities of either decreasing the cost or improving the qualities of standard portland cement used in hydraulic structures by blending it with pozzolanic materials.

About 400 references are included.

Physical properties of speed portland and blended cement mortars and concretes, R. E. MILLS and R. B. CREPPS (*Purdue Engin. Expt. Sta. Res. Ser. 47 (1934), pp. 60, figs. 39*).—This bulletin reports data on the more important physical properties of mortars and concretes manufactured from both a normal portland cement and a blended cement. The blended cement was prepared by blending three volumes of normal speed portland cement with one volume of Louisville natural cement. The physical characteristics of the two cements were studied in an extensive series of comparative tests, involving strength (tension, compression, and flexure), plastic flow, resistance to fatigue, expansion and contraction, durability, etc.

Little difference was found in the tensile strengths of the two cements for all ages up to 1 yr. Slightly higher compressive strengths and modulus of rupture values were recorded for the speed portland cement as compared to the blended cement at all ages. However, this difference appears to decrease with advancing age, all values being within a range of approximately 9 percent at the end of 1 yr.

Measurements of plastic flow in concrete compression cylinders under sustained loads show that the blended cement exceeds the speed cement for all conditions of test by about 20 percent.

The fatigue endurance limit of cement mortar beams, tested at the age of 28 days, was approximately 50 percent for the speed cement and slightly higher for the blended cement. Similar tests conducted at the age of 4 mo. gave a fatigue endurance limit of about 51 percent for speed cement and of 60 percent for blended cement.

Expansion and contraction observations of small mortar beams exhibit several distinct tendencies: (1) Practically no difference in the expansion of the two cements during the initial period of moist room storage, (2) slightly more contraction for the blended cement as compared with the speed cement for prolonged periods of air drying, and (3) approximately the same expansion for both cements during extended periods of immersion in water.

Durability tests (freezing and thawing) were conducted on concrete and mortar cubes made from both speed cement and blended cement. An examination of the individual specimens indicates little difference in the resistance of the two cements. In all cases the breaking down of the mortar specimens progressed less rapidly than was evident for some of the concrete specimens. A close inspection of the concrete specimens, showing disintegration, revealed that in most cases large pieces of soft or laminated coarse aggregate were embedded near the surface and had popped out or produced cracking as the freezing and thawing action progressed.

Design of concrete structures, L. C. URQUHART and C. E. O'ROURKE (*New York and London: McGraw-Hill Book Co., 1935, 3. ed., pp. IX+556, figs.* [255]).—This is the third edition of this book (E. S. R., 58, p. 375), in which most of the material has been rewritten to include the latest and best practice in plain and reinforced concrete design.

Modern methods of design and control of concrete mixtures are described in detail. In the development of the elementary design theory the principle of the transformed section has been used in addition to the usual design formulas. The chapter on the continuous frame has been rewritten to show more clearly the interrelation of the moments in the intersecting and adjacent members. Additional material has been added to the chapter on footings, including designs of typical multiple-column footings and the method of proportioning footings for uniform settlement. The chapter on buildings has been expanded to include a larger variety of types of floor construction, particularly those for the lighter loadings. Complete designs are given for all types. In the chapter

on highway bridges complete designs of the various types of concrete bridges have been included, and essential construction details of these structures have been given.

Tables and diagrams have been expanded for use with the higher strength concretes of the present day.

An investigation of stresses in prestressed reinforced concrete pipes, R. B. CREPPS (*Purdue Engin. Expt. Sta. Res. Ser. 46 (1934), pp. 74, figs. 29*).—This bulletin presents the results of an investigation of the stresses produced in a recently developed type of prestressed reinforced concrete pipe when the pipes were being prestressed and when they were being subjected to internal water pressures.

The prestresses of greatest significance in this type of structure are the tension stresses in the hoop rods and the circumferential compression stresses in the concrete. The results of prestressing indicate that the magnitude of stresses measured on the surfaces of the pipes is related to the stresses in the steel rods. For the same unit steel prestress, the concrete circumferential compression prestress differs in the three pipes because of the different quantity of steel and the variations in the concrete used; however, from approximate averages, the compression prestress on the outside surface is 1.4 percent of the hoop rod stress and on the inside surface it is 2.3 percent of the hoop rod stress. The concrete circumferential prestress on the outside surface and that on the inside surface is 76 percent and 124 percent, respectively, of the average between them.

Internal pressure altered the stresses produced in prestressing by slightly increasing the initial tension prestress in the steel hoop rods and by decreasing the circumferential compression prestress in the concrete. The magnitude of the change in these stresses is dependent upon the magnitude of the prestress and of the internal pressure. For these pipes a high initial steel stress, equal to more than 75 percent of the elastic limit strength of the steel, could be used in prestressing without encroaching upon the elastic limit stress of the steel when the pipes carried maximum internal pressure. A pipe highly prestressed will resist a large internal fluid pressure; however, in prestressing, the stresses in both steel and concrete should be and were kept within the elastic range of the respective materials. The prestressed type of pipe is very effective in resisting external loads.

Wire rope, J. F. HOWE and N. CARLSON (*Jour. Boston Soc. Civ. Engin., 23 (1936), No. 1, pp. 33–39, figs. 2*).—A brief summary is presented of the fundamentals to be considered in any problem affecting the use of wire rope.

Public Roads, [March 1936] (*U. S. Dept. Agr., Public Roads, 17 (1936), No. 1, pp. 20+[1], figs. 16*).—This number of this periodical contains the current status of Federal-aid highway projects, U. S. Public Works Program highway and grade-crossing projects, and U. S. Public Works road construction, all as of February 29, 1936, and an article entitled The Minnesota Financial Survey, by E. Church (pp. 1–17).

Rural electrification, J. P. SCHAENZER (*New York: Bruce Pub. Co., 1935, pp. IX+266, figs. [169]*).—This is a popular treatise on the subject, based largely on the author's experience as project director of the rural electrification research and educational program conducted by the University of Wisconsin. It contains chapters on electricity the silent partner, how electricity is made and distributed, serving the farm customer, wiring materials, wiring maintenance and repair, wiring the farmstead, wiring the home, wiring the barn and outbuildings, lights and lighting, farm electric-lighting plants, electric motors, fractional-horsepower motor applications, silage cutters, feed grinders,

wood sawing, hay hoisting and baling, farm water supply, poultry house lighting, the electric incubator and brooder, the milking machine and cream separator, dairy refrigeration, other electrical equipment for the dairy, the electric hotbed, laundry and cleaning equipment, and kitchen and household equipment.

A progress report on the investigation of the various uses of electricity on the farms of Washington for the year 1935, L. J. SMITH and H. L. GARVER (*[Pullman]: Wash. Com. Relat. Elect. Agr., 1936, pp. 23, pls. 5*).—Included in this report are the progress results of experiments on the development of a vegetable washer, pasture irrigation, heating of bait traps for codling moth control, and fruit and vegetable processing.

Electric motors for farm machinery, F. E. ROWLAND (*Rural Electrif. and Electro-Farming, 11 (1936), No. 129, pp. 287–291, figs. 5*).—Technical data are presented on the subject.

Motorization of draft work of Norwegian agriculture [trans. title], Å. BERDAL (*Meld. Norges Landbr. Høiskole, 15 (1935), No. 7–8, pp. 559–731, figs. 31*).—A technical study of power farming in Norway is presented, the purpose being to provide the basis for economical motorization of the draft operations. Special attention was given in the study to the comparative economies of horsepower and tractor power. The conclusion is that the economical use of tractors is practically impossible in the valley, mountain, and fiord regions of Norway on account of the topography and size of farms. The best conditions for tractor use are found in the regions where loam soils predominate.

The relation of power to anti-knock fuel requirements for multicylinder engines, S. D. RUBENZ (*Jour. Franklin Inst., 220 (1935), Nos. 5, pp. 615–656, figs. 14; 6, pp. 755–788, figs. 16*).—It is pointed out that when testing multicylinder engines under constant speed and load conditions the inception of knock is best detected by the consequent rise in temperature of the cylinder head or cylinder walls.

A convenient arrangement for carrying out such tests on different engines, using a given fuel with various amounts of tetraethyl lead fluid added per gallon, is described, and typical results are reported.

The effects of various factors affecting the antiknock fuel requirements are considered in relation to simultaneous variations in power output. It is shown that complete separation of the phenomena due to these different factors is impossible, and that the effects cannot be predicted but must be determined by the results of a series of tests for any particular engine.

It is also shown that the sensitivity of different fuels to the addition of ethyl fluid varies considerably even when they have the same original octane number. It is necessary, therefore, for a complete and reliable solution to the problem, not only to test each engine but also to determine the sensitivity of each fuel to the addition of ethyl fluid.

A study of the economical loading and operation of motor trucks, A. J. SCAIFE (*S. A. E. [Soc. Automotive Engin.] Jour., 38 (1936), No. 1, Trans., pp. 1–10, figs. 9*).—A large amount of data is analyzed and discussed, indicating that it is poor economy to operate a motor truck out of its class by overloading.

When is a truck tire overloaded? J. E. HALE (*S. A. E. [Soc. Automotive Engin.] Jour., 38 (1936), No. 1, Trans., pp. 25–44, figs. 31*).—Lengthy consideration is given to tire overloading, with the understanding that overloading as referred to in tire failures is quite different from the application of the term overload to structural materials which collapse under a reasonably well-defined excess of load.

A discussion included of various other phases of the tire business is intended to be instructive along the line of longer life and greater freedom from trouble.

The increasing varieties of service in which motor vehicles are being placed demand different types and characteristics of tires, which are outlined, and the relative merits of balloon type v. high-pressure-type tires are discussed. The choice of tires for new trucks is covered in a practical way, and there is a section outlining the variations of the basis for determining loads and air-pressure recommendations. For the truck operator's benefit, there is included a section as to what the operators should know and practice to get the most out of tires, discussing the importance of inflation, dual mating, wheel alignment, repairs, and retreading on both tires and inner tubes.

Use of graphite to prevent clogging of drills when sowing dusted pea seed, E. L. ARNOLD and J. G. HORSFALL (*New York State Sta. Bul. 660 (1936), pp. 23, figs. 5*).—Studies are reported which showed that the introduction of a thin layer of a nonlubricating dust fungicide, like red copper oxide, between the interfaces of seeds increases the friction between them. In the case of peas the added friction may be so much as to clog and break grain drills of the internal force-feed type.

This friction between treated seeds, the factors that govern it, and the correction of the trouble with lubricants, especially graphite, were studied in the laboratory using single, hand-cranked, standard drill cups and other seeding machinery. The number of turns necessary to pass a uniform lot of seed through the cup gave a usable index of friction.

The index of friction was found to vary with the dosage of red copper oxide, with mixing time, and with moisture content of the seed The lubricating effect of 325-mesh flake graphite applied at treating time reduced the friction between dusted pea, cabbage, and wheat seeds in proportion to the dosage. It usually required approximately half as much graphite by weight as fungicidal dust to reduce the friction to normal. Talc, air-floated mica, and carbon black were worthless as lubricants.

The friction between dusted seeds causes them to flow less rapidly through drilling machinery than undusted seeds. As a consequence the stand of plants per foot of row may be thinner from treated than from untreated seeds, especially if decay organisms do not reduce the stand from the untreated seeds. Thus the study indicates the importance of considering the effect of seed protectants not only on drilling machinery but also on the seeding rate.

How to build a wind-proof gothic barn, A. W. HOLT (*Amer. Builder and Bldg. Age, 57 (1935), No. 8, pp. 46–49, 71, figs. 5*).—Structural details are presented and discussed.

A text book on heat, A. W. BARTON (*London and New York: Longmans, Green & Co., [1934], pp. XIII+378, figs. 110*).—This book contains chapters on the measurement of temperature, specific heat and latent heat, the expansion of solids, the expansion of liquids, the expansion of gases, change of state, the properties of vapors, the dynamical theory of heat, the kinetic theory of gases, the relation between the liquid and gaseous states, Van der Waals' equation and the liquefaction of gases, cyclical operations and adiabatic changes, the second law of thermodynamics, conduction, and radiation.

Temperature stresses in chimneys and tanks, H. CARPENTER (*Concrete and Construct. Engin., 31 (1936), No. 2, pp. 105–113, figs. 9*).—A technical analysis of these stresses is presented.

The "Chatham heater" for the small sash house, J. G. WELLS, JR. (*Michigan Sta. Quart. Bul., 18 (1936), No. 3, pp. 148–151, figs. 3*).—A heater for the small sash greenhouse is described and illustrated, the principle of which is that of using heat retained in heated stones.

The Chatham heater consists of an oil drum surrounded by stones. A comparison of this heater with other types for poultry houses has shown that

the same stove rocked in with stone set in mortar held more even temperatures and required less fuel than those not covered. A coal heater used in the laying houses in comparison to a wood heater proved as efficient in heating the house, and burning low-priced splint coal the fuel cost was found lower than the retail price of wood. It is believed that any coal-burning heater can be covered with stone and used in the sash house with as good results as the wood burner tried, but care should be taken that the flue is built so that wind will not blow down the chimney and fill the plant house with coal gas.

Heating and air conditioning, J. R. ALLEN and J. H. WALKER (*New York and London: McGraw-Hill Book Co., 1935, 4. ed., pp. VII+444, figs. 242*).—This is the fourth edition of this book, formerly entitled Heating and Ventilation. It contains chapters on heat and the properties of steam; heat losses from buildings; methods of heating; warm-air furnace heating; radiators; fuels and boilers; steam heating systems; pipe, fittings, valves, and accessories; steam piping; temperature control; central and district heating—electric heating; air and its properties; principles of air conditioning; ventilating and air-conditioning systems; design of central fan systems; unit systems; filters, washers, and humidifiers; artificial cooling; industrial air conditioning; and a chapter on hot-water heating systems, by F. E. Giesecke.

Drier air for summer comfort, V. L. SHERMAN (*Amer. Builder and Bldg. Age, 57 (1935), No. 8, pp. 34–36, figs. 4*).—In a contribution from Lewis Institute of Technology, Chicago, Ill., air-conditioning equipment for homes is briefly described and illustrated.

Rural sanitation, H. E. MILLER ET AL. (*Amer. Pub. Health Assoc. Yearbook, 1935–36, pp. 230, 231*).—This is the annual report of the Joint Committee on Rural Sanitation of the Conference of State Sanitary Engineers, the American Society of Agricultural Engineers, and the American Public Health Association. It deals with the community sanitation projects developed in 24 States under the Civil Works Administration, which involved the installation of over 500,000 sanitary privies and over 5,400 septic tank-sewage disposal systems.

Farm water supply equipment, C. A. CAMERON BROWN (*Jour. Min. Agr. [Gt. Brit.], 42 (1935), No. 4, pp. 319–325*).—In a contribution from the Institute for Research in Agricultural Engineering at Oxford University technical information is presented on the subject.

Nitrifying bacteria in water suplies, D. FEBEN (*W. Va. Univ. Bul., 35. ser., No. 4 (1934), pp. 13–23*).—Studies are reported the results of which indicate that Great Lakes water (and presumably all surface waters) definitely contain nitrifying bacteria of an undetermined species. Artificial methods of culture are simple and direct. Sand filtration after ammoniation promotes their growth during suitable water temperatures to a point where the chloramine process defeats its own purpose and becomes costly, due to wasting of both ammonia to feed the bacteria and chlorine to oxidize their products. Their resistance makes it appear impossible or impractical to control nitrification by chlorination.

Sewage sedimentation and soil purification in the tropics [trans. title], C. P. MOM and N. D. R. SCHAAFSMA (*Meded. Dienst Volksgezondh. Nederland. Indië, 22 (1933), No. 3, pp. 161–181, figs. 7*).—In investigations conducted in the Dutch East Indies, observations were made of the soil in the vicinity of septic tanks. Specimens of soil obtained from borings showed the presence of fecal bacteria to a depth of 10 m (32.8 ft.). It also was found that the destruction of fecal bacteria is very slow in soil. *Bacterium coli* introduced into the ground 50 m from sources of water supply were demonstrated in the water after 37 days.

Dust explosions during fire fighting, D. J. PRICE (*U. S. Dept. Agr. Circ. 385 (1936), pp. 10, figs. 10*).—Practical information is presented on the prevention of dust explosions during fire fighting.

AGRICULTURAL ECONOMICS

[Notes on agricultural economics] (*Jour. Farm Econ., 18 (1936), No. 1, pp. 191–198*).—Included are notes on What is Part-Time Farming, by L. A. Salter, Jr., and The Use of Pasture in the Economic Production of Fluid Milk in Delaware, by R. O. Bausman.

[Papers presented at the twenty-sixth annual meeting of the American Farm Economic Association] (*Jour. Farm Econ., 18 (1936), No. 1, pp. 1–190, fig. 1*).—Included are the following papers, with discussions thereon, presented at the meeting held in New York City December 27–30, 1935: Farm Economists and Agricultural Planning, by H. A. Wallace (pp. 1–11); Validity of the Fundamental Assumptions Underlying Agricultural Adjustment, by M. L. Wilson (pp. 12–26) and O. B. Jesness (pp. 27–43); Some Observations on the Agricultural Program in Canada, by J. F. Booth (pp. 59–63); Progress and Problems in Agricultural Planning: In the New England and Middle Atlantic States, by I. G. Davis (pp. 64–74); In the North Central States, by H. C. M Case (pp. 75–85); In the Southern States, by G. W. Forster (pp. 86–94); and From the National Point of View, by F. F. Elliott (pp. 95–106); Some State Problems in Agricultural Statistics, by W. H. Ebling (pp. 107–126); Some New Developments Designed to Extend the Scope and Improve the Accuracy of Agricultural Information, by A. Hobson (pp. 131–142); The 1935 Census: An Appraisal from the Viewpoint of Crop Estimates, by J. A. Becker (pp. 143–150); A National Program of Farm Management Research, by C. L. Holmes (pp. 153–168); Statistical Analysis in Farm Management Research, by S. W. Warren (pp. 169–179); and Farm Management Research in Relation to Agricultural Adjustment and Rehabilitation, by P. L. Slagsvold (pp. 180–190).

Proceedings of Western Farm Economics Association, 1935 (*West. Farm Econ. Assoc. Proc., 8 (1935), pp. [4]+102*).—Included are the following papers presented at the meeting held at Corvallis, Oregon, April 12 and 13, 1935: Laissez Faire in Theory and Practice, by G. M. Peterson (pp. 1–9); An Evaluation of Some Phases of the Current Agricultural Program in Terms of the Economic Theory Involved, by M. R. Benedict (pp. 10–23); The Place of Agricultural Planning in National Economy, by J. M. Tinley (pp. 24–34); Extension Work as Related to Regional Planning, by L. M. Vaughan (pp. 35–41); Some Economic Aspects of Marketing Agreements for Fruits and Vegetables, by H. R. Wellman (pp. 42–51); Some Experiences with Marketing Agreements in Washington, by E. F. Dummeier (pp. 52–57); The Organization of Land Use Planning in Oregon, by A. S. Burrier (pp. 58–62); General Aspects of Land Use Planning, by D. Weeks (pp. 63–73); Aims and Objectives of The Resettlement Administration, by R. E. Willard (pp. 74–78); Land Use Planning, by H. E. Selby (pp. 79–82); The Rural Rehabilitation Program, by L. S. Sorensen (pp. 83–87); Objectives And Types of Development on Submarginal Land, by H. G. Ade (pp. 88–92); Production Control, by O. V. Wells (pp. 93–96); and Proposed Changes in Agricultural Adjustment Programs, by E. R. Jackman (pp. 97–102).

[Investigations in agricultural economics at the Michigan Station] (*Michigan Sta. Quart. Bul., 18 (1936), No. 3, pp. 135–147, 173–177*).—Included are articles on The Canadian Trade Agreement and Michigan Agriculture, by H. S. Patton; on Silk Production, by R Hutson and F. C. Bradford; and 1935 Poultry Costs in Michigan, by K. T. Wright, which supplements the article previously noted (E. S. R., 73, p. 552).

[Investigations in agricultural economics and sociology at the Ohio Station] (*Ohio Sta. Bimo. Bul. 179 (1936), pp. 58–60*).—In an article entitled Origin of the Rural Population of Ohio, a table is included and discussed by C. E. Lively showing for 1930 for the total, urban, rural-farm, and rural-nonfarm population of the State, the numbers born and living in Ohio, born in Ohio and living in other States, and born in other States and living in Ohio. The table of index numbers of production, prices, and income, by J. I. Falconer (E. S. R., 74, p. 866) is brought down through November 1935.

Current Farm Economics, Oklahoma, [February 1936] (*Oklahoma Sta., Cur. Farm Econ., 9 (1936), No. 1, pp. 39, figs. 4*).—Included, in addition to the usual tables of index numbers of prices in the United States and Oklahoma and prices and purchasing power of Oklahoma farm products, are articles on Geographical Variability in Types of Farming in Oklahoma, by P. Nelson (pp. 3–15); An Effective Homestead Exemption Will Reduce Farm Tenancy, by J. T. Sanders (pp. 16–19); The Community Sale, by A. W. Jacob (pp. 19–21); Poultry and Eggs, by H. A. Miles (pp. 21. 22); Response of Cotton Prices to Cotton Acreage Control, Dollar Devaluation, and the 12-Cent Loan, by T. R. Hedges pp. 22–28); Lessons From the Old Cotton Program for the New Program, by Sanders (pp. 29–36); and The Agricultural Situation, by Hedges (p. 37–39).

An agricultural policy for the United States (*Washington, D. C.: Natl. Coop. Council, Spec. Leg. Com., 1936, pp. 24*).—This booklet includes (1) the preliminary report of the special legislative committee appointed by the National Cooperative Council to formulate a plan for putting into effect the principles underlying the council's national agricultural policy, and (2) a discussion of the constitutional questions relating to the proposed plan of assisting agriculture through surplus management, by K. D. Loos.

The trade agreements program and American agriculture, L. R. Edminster (*Amer. Econ. Rev., 26 (1936), No. 1, Sup., pp. 129–140*).—The progress that has been made under the Trade Agreements Act of June 1934, the concessions made and obtained by the United States in agreements with different countries, some of the arguments for and against such agreements, etc., are discussed. The author concludes that "in the interest both of agriculture and of the country as a whole there should be such a widespread public support of the trade agreements program as will assure its continuance and expansion. . . . Much of lasting value has already been achieved through the Trade Agreements Act. With the support of an informed public opinion, much more can be accomplished in the future."

Bases for land utilization programs, O. J. Hall (*Southwest. Social Sci. Quart., 16 (1935), No. 3, pp. 60–67*).—This is a paper presented at a meeting of the Southwestern Social Science Association on April 19, 1935.

Goals for agriculture in the Southwest, E. D. Tetreau (*Southwest. Social Sci. Quart., 16 (1935), No. 3, pp. 45–50*).—This is a paper presented before the Southwestern Agricultural Outlook Conference held at Texarkana, Ark., December 10, 1934.

Land planning, L. C. Gray (*Pub. Policy Pam. [Univ. Chicago Press] 19 (1936), pp. IV+37*).—The principles of land planning, past land policies in the United States, recent activities in planning, and the major factors influencing land requirements are discussed, and recommendations made as to lines of action and a land program.

Kentucky State Planning Board Progress Report, 1935 (*Louisville: Ky. State Planning Bd., 1935, rev. ed., pp. [15]+365, pls. 242; App., pp. [6]+146*).—Basic information relating to the State considered necessary for orderly planning is presented in chapters on Brief Sketch of the Agricultural, Industrial, and Mineral Development of Kentucky Prior to 1900, by W. W. Jennings;

Rural Land Use in Kentucky, by B. Poundstone; Survey of the Geology and Mineral Resources of Kentucky, by A. C. McFarlan; Water Resources, by A. A. Krieger; Transportation, by A. A. Krieger; Conservation and Outdoor Recreation, by L. Beckner; Miscellaneous Factors Relating to the Favorableness of Kentucky as a Manufacturing Center, by D. McKinney; and Programing of Public Works by J. E. Barker.

Tables are included in a separate appendix.

First annual report of progress (*Trenton: N. J. State Planning Bd., 1935, pp. 147, [pls. 11], [figs. 49]*).—This is a preliminary report upon planning surveys and planning studies for New Jersey. It "deals almost exclusively with State-wide surveys and studies directed toward long-range planning for the sound development of this State, with relatively little emphasis upon many other important but more routine activities of the board, including cooperation with and assistance to the several Federal and State emergency public-work and relief agencies."

An economic study of land utilization in Chemung County, New York, T. E. La Mont ([*New York*] *Cornell Sta. Bul. 640 (1936), pp. 84, figs. 17*).—This bulletin is the third in the series previously noted (E. S. R., 72, p. 709). "These studies include (1) a classification of land according to intensity of present and probable future use, (2) a study of the economic value of the different land classes and soil types, [and] (3) the preparation of suggested road and electric programs for the intensive development of the land that probably will remain permanently in agriculture." The methods used in the study are those previously noted (E. S. R., 72, p 118). The present study also includes a detailed analysis of the effects of topography and elevation in the use of land.

"About 43 percent of the county is in land class I and 21 percent in land class II. Most of land class I is idle or in woods and is primarily adapted to forestry and recreational uses. A large amount of land class II is idle or in woods, but, on a considerable part, farming is still being carried on. This land is better suited to forestry and recreational uses than to agriculture.

"Land in classes III to VI is land that is adapted to permanent agriculture; about 32 percent of Chemung County is in these land classes. . . .

"Practicaly all farms that will remain in agriculture permanently should be served by hard roads, electric lines, and other modern services. In land classes III to VI, about 41 percent of the farms were on dirt or gravel roads, and 42 percent did not have electric service available in 1933. Suggested road and electric programs have been prepared so that practically all the farms in these land classes, which probably will remain in agriculture permanently, will be served by hard roads and electric lines."

Readjusting Montana's agriculture, II–V (*Montana Sta. Buls. 308 (1936), pp. 16, figs. 11; 309, pp. 19, figs. 11; 310, pp. 24, figs. 11; 311, pp. 30. figs. 7*).—These bulletins continue the series previously noted (E. S. R., 74, p. 868).

II. *Montana farm prices*, P. L. Slagsvold.—This includes and discusses tables and charts showing the trends and seasonality of Montana prices for farm products, the prices by districts of the State, and prices paid by Montana farmers for commodities purchased.

III. *Population resources and prospects*, R. R. Renne and C. F. Kraenzel.—This presents and discusses maps and charts showing the population, density, farm and city population, age distribution of population, changes in population from 1920 to 1930, and the estimated future population of the State.

IV. *Land ownership and tenure.*—R. R. Renne.—This includes and discusses maps showing the ownership of lands, number and size of farms, amount and distribution of tenancy, and the trends in each. It also discusses the causes for the recent changes and the probable future use and control of lands.

V. *Economic changes in Montana's range livestock production*, M. H. Saunderson.—This discusses the present situation as regards balance between livestock numbers, range land capacity, and feed production, range and farm livestock distribution and ranch organization, land values and land charges, land ownership and tenure, and size of ranches. It also discusses possibilities of remedying the present situation by adjustments in land charges and land values, in land ownership and tenure, in the relation between livestock numbers and range capacity, in ranch organization and range livestock production to other types of agriculture, and in size of ranches.

Ranch and range balance: The public lands and ranch stability in Nevada, C. E. FLEMING, C. A. BRENNEN, G. H. SMITH, JR., and M. R. BRUCE (*Nevada Sta. Bul. 142 (1936), pp. 22, figs. 3*).—The results of fairly good ranch and range balance v. unbalance are compared, using data from the Ruby and Santa Rosa divisions of the Humboldt National Forest in 1934. The areas are described and comparisons made of forest permits, land loans, earning power of ranches, etc.

Submarginal farm lands in New York State, C. N. LANE (*Albany: N. Y. State Planning Bd., 1935, pp. XII+56+[1], figs. 23*).—This is a report to the New York State Planning Board. It discusses why some lands are submarginal for agriculture, the characteristics of such areas and why the lands were settled, the method used in classifying the lands of the State, the rural land-use problem, and the problems and possible benefits of a State program of reforestation.

Part-time farming in Oregon, G. W. KUHLMAN, T. J. FLIPPIN, and E. J. NIEDERFRANK (*Oregon Sta. Bul. 340 (1935), pp. 49, figs. 11*).—This study consists of two phases—(1) an investigation in cooperation with the Oregon Emergency Relief Administration of the possibilities on small farm tracts, the problems involved, mistakes to be avoided, etc., and (2) a survey of the industries in Oregon employing rural labor. Records were obtained in 1934 from 1,810 owner-operated and 300 rented part-time farms and from 216 establishments employing 3,800 full- and part-time employees living on farms. Analysis is made of the part-time farm records to show the size of family, age, farming experience, previous occupation, and other occupations of the farmers; size and type of holding, use of land, machinery, livestock, and marketing methods; capital, methods of financing, and total and farm income and expenses; and the effects of amount of supplemental employment, distance to work, size of farm, quality of land, and amount of livestock on success of part-time farming. The types of industries employing rural labor, the extent and seasonability of such employment and the possibilities of its expansion, and the attitude of part-time farmers toward such farming are discussed.

The average farm was 10 acres, with 4 acres in cultivation. Fifty percent of the part-time farms were located in rural communities and 50 percent in suburban areas. The average investments per farm were land $1,288, buildings $1,374, and machinery and livestock $122. Only 9 percent of the houses were classed as poor. Less than 50 percent of the operators were in debt, 27 percent were tax delinquent, 18 percent received some relief employment, and 12 percent received relief supplies. The average family received $117 from the sale of farm products, $597 from wages, and $67 from miscellaneous sources, and the value of farm products used was $173. Ninety-four percent of the farmers were satisfied and only 4 percent expressed dissatisfaction.

The industries surveyed, in general, considered the labor of part-time farmers satisfactory but reported that the supply of such labor is adequate.

Agricultural resources [South Dakota] (*Brookings: S. Dak. State Planning Bd., 1936, pp. [187], figs. [74]*).—This is a preliminary report of the Agricul-

tural Resources Committee of the State Planning Board. It discusses the natural advantages, topography, soils, climate, etc., of the State, farm power, crop and livestock problems, farm finances, marketing, prices, and purchasing power of farm products, taxation of real estate, land tenure, land uses and conservation, rehabilitation, soil erosion, and permanent plans for agriculture.

Forces affecting Wisconsin agriculture, with resulting types of farming, P. E. McNall and W. J. Roth (*Wisconsin Sta. Res. Bul. 131 (1935), pp. 41, figs. 46*).—The more important factors affecting different kinds of agricultural production within the State, the location of the more important farming type areas, and the reasons for this development, together with some of the problems of Wisconsin farmers, notably soil erosion and loss of soil fertility, are discussed.

Back to the land, C. S. Orwin and W. F. Darke (*London: P. S. King & Son, 1935, pp. VIII+93, figs. 2*).—The history of attempts to resettle lands in England is traced, and the sizes and types of small holdings, the statutory small holdings, some results of past land settlement, and its future are discussed.

Estimating the value of farm lands, T. D. Morse (*Jour. Amer. Inst. Real Estate Appraisers, 4 (1936), No. 2, pp. 159–165*).—The method of making appraisal of the value of farm real estate under the system outlined in the report of February 2, 1934, of the appraisal subcommittee of the National Joint Committee on Rural Credits is discussed and illustrated.

Economic and social aspects of farm tenancy in Texas, K. E. Ashburn (*Southwest. Social Sci. Quart., 15 (1935), No. 4, pp. 298–306*).—This is a brief description of the condition of farm tenancy existing in the State.

Relations between Federal, State, and local finances, C. Heer (*Amer. Econ. Rev., 26 (1936), No. 1, Sup., pp. 174–181*).—This is a general discussion of the subject and of proposed remedies for the situation.

Public revenue in Ohio with especial reference to rural taxation, H. R. Moore and J. I. Falconer (*Ohio Sta. Bul. 560 (1936), pp. 44, figs. 4*).—Tables and charts are included and discussed showing the amounts of Federal revenues collected in Ohio and the expenditures made as direct payments to the State, and the amounts and sources of revenues collected by the State and its subdivisions and the services rendered in the expenditure of such revenues. Other tables present data as to general property taxes, delinquent taxes, and the trend of farm taxes in the State.

Federal internal revenues collected in Ohio increased from $4.99 per capita in 1913 to $17.31 in 1934. Total revenue collections of the State and its subdivisions were 3.47 times as much in 1933 as in 1913, the per capita collection being 2.47 times as high. General property taxes in 1933 constituted 57.78 percent and special assessments on real estate 4.49 percent of the total tax collections, as compared with 80 percent in 1916. Sources other than property provided 9 percent of the revenues in 1913 and 26 percent in 1933. Local public debt has been the most disturbing factor in the finances of many subdivisions of the State since 1929, due to the large share of the reduced revenue required for fixed charges.

Taxation trends and their relation to agriculture, C. O. Brannen (*Southwest. Social Sci. Quart., 16 (1935), No. 3, pp. 20–23*).—This is a paper presented at the Southwestern Social Science Association meeting held at Oklahoma City, Okla., April 19–20, 1935.

Tax delinquency on rural real estate in New Mexico, R. P. Calloway and P. W. Cockerill (*New Mexico Sta. Bul. 234 (1935), pp. 28, figs. 5*).—Analysis is made of tax data for 10 of the 31 counties of the State to show the extent and changes in delinquency, its relation to cash income and types of farming, the

classes of farm real estate most delinquent, etc. The administration of laws relating to delinquency and measures designed to reduce delinquency are discussed.

Twenty-eight percent of the assessed acreage of rural real estate was delinquent on the 1932 levy, this being an increase of 121 percent over the delinquency on the 1928 levy. The increase was due largely to heavy losses in farm income and purchasing power of farm products, 40.3 percent of the levy on rural real estate being delinquent in 1932 as compared with 17.4 percent on other classes of property. Delinquency was greater on farm lands than on grazing lands, and in irrigated areas than in dry farm areas. Relief to delinquent taxpayers has been effected through a 20-mill limitation on levies, a school emergency sales tax, and the waiver of penalties and interest.

A new map of the dairy areas of the United States, R. HARTSHORNE (*Econ. Geogr., 11 (1935), No. 4, pp. 347–355, figs. 3*).—Included and discussed is a map showing both the relative and absolute importance of dairying in the different parts of the United States. Relative importance of the industry is measured in terms of milk production in proportion to the cropland.

Distribution of milk under public utility regulation, W. P. MORTENSON (*Amer. Econ. Rev., 26 (1936), No. 1, pp. 23–40*).—Distributors' margins, the effect of a reduction of such margins on prices paid farmers, the developments leading to present inefficiencies in milk distribution, and experiences in and the legal and economic features of public control of milk distribution are discussed.

Grade, staple length, and tenderability of cotton in the United States 1928–29 to 1933–34 (*U. S. Dept. Agr., Statis. Bul. 52 (1936), pp. 122, figs. 11*).—This bulletin supplements that previously noted (E. S. R., 73, p. 123), and presents detailed figures collected in cooperation with 14 experiment stations and the California State Department of Agriculture on grade, staple length, and tenderability of cotton ginned from the 1933 crop, and of cotton on hand on August 1, 1934.

Farm prices and quality of Missouri cotton, L. D. HOWELL, J. S. BURGESS, JR., and F. L. THOMSEN (*Missouri Sta. Res. Bul. 233 (1936), pp. 32, figs. 7*).—This study, made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., was conducted along the same general lines as those summarized in the bulletin previously noted (E. S. R., 75, p. 127) and the findings and recommendations in general are the same. The data were collected in four local markets in 1929–30, two each in 1930–31 and 1931–32, and one each in 1932–33 and 1933–34. Central market prices used were those of the Memphis market except for $^{13}/_{16}$-in. staple, where an average of the Houston, Galveston, and New Orleans markets was used.

Government control of cotton production in the United States 1933–1935, compiled by E. L. DAY (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 63 (1936), pp. [2]+59*).—Included are 326 annotated references selected from publications during the period 1933–35.

Account principles for cooperative cotton gin associations, O. T. WEAVER (*Farm Credit Admin. [U. S.], Coop. Div., Bul. 2 (1935), pp. III+92, figs. 2*).—This is the first of a series of publications on accounting principles for agricultural cooperative associations. It outlines some of the basic principles of accounting related to the business of cooperative cotton gin associations, shows how these principles may be applied to any practical set of forms, and points out some of the benefits to be realized from their use.

An economic study of the potato enterprise in Michigan, P. F. AYLESWORTH (*Michigan Sta. Spec. Bul. 267 (1935), pp. 42, figs. 14*).—This study was made to determine the physical and financial requirements of producing po-

tatoes and the effects of management practices and other conditions on yields and costs, and to compare the costs in different parts of the State. The data were obtained from cooperative farmers for the 4 yr. 1930–33 for table stock producers, and for the 5 yr. 1930–34 for certified seed producers. The importance of the crop, production prices, and the physical and climatic conditions of the areas are described. Analysis is made, for each type of production, of the cost of production and the factors affecting such cost.

The table stock producers averaged 10.2 acres of potatoes per farm, used 12 bu. of seed, 97 lb. of fertilizer, 56 hr. of man labor, 45 hr. of horse work, and 1.9 hr. of tractor work per acre. The yields averaged 126 bu. per acre and the costs 34 ct. per bushel. Certified seed producers averaged 8 acres of potatoes, used 20 bu. of seed, 380 lb. of fertilizer, 95 hr. of man labor, 54 hr. of horse work, and 4.5 hr. of tractor work per acre. Their average yield was 241 bu. per acre, and the average cost 34 ct. per bushel, field run. Cost of production ranged on the individual farms from $19.48 to $134.55 for table stock potatoes, and from $29.38 to $154.96 for certified seed potatoes. Yields ranged from 24 to 381 bu. for table stock, and 75 to 615 bu. for certified seed potatoes.

Fall plowing lowered costs. Early planting, except in the southern part of the State, increased quality. Profits are probable only if costs are kept below approximately 40 ct. per bushel, which requires yields above 150 bu. per acre. Growers who followed over 75 percent of the good practices recommended had yields 150 to 200 percent greater than those for growers who followed but 25 percent of such practices. Many of the growers would have profited by reducing their acreage 20 to 30 percent and spending the same labor, seed, power, etc., on the reduced acreage.

Wheat studies of the Food Research Institute (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 12 (1935), Nos. 3, pp. [2]+57–100, figs. 3; 4, pp. [2]+101–182, figs. 26*).—These reports include an article on Japanese Self-sufficiency in Wheat, by C. S. Alsberg; and The World Wheat Situation, 1934–35—A Review of the Crop Year, by J. S. Davis.

Seasonal and short-time fluctuations in wheat prices in relation to the wheat-price cycle, R. M. Green (*Kansas Sta. Tech. Bul. 39 (1935), pp. 52, figs. 14*).—"This study of wheat prices is an application of the so-called 'movement theory' in the behavior of prices as opposed to the 'normal price' or 'level' theory." Analysis is made for the period 1910–31 of the Kansas City cash prices of top No. 2 hard wheat; the relationships between the top and low quotations for such wheat, between the low cash and low future quotations for such wheat and between Kansas City and Chicago future prices, and the volume of future trading and open commitments. The cycle of prices is defined on the basis of the top No. 2 hard wheat cash price at Kansas City. Tables and charts show the changes in prices from month to month in periods of upward and downward trends in the cycles, the volume of trading and price in wheat price recovery and recession periods, the relationship of volume of trading and prices to open interests, the cash-future and high and low cash spreads at Kansas City, the Kansas City-Chicago intermarket spreads, etc. The reasons for the special significance of certain shorter time price movements are discussed.

The author reaches conclusions as follows: "(1) Because of the variation in relationships from one end of a wheat-price cycle to another, a correlation analysis of such a time series without regard to cyclical characteristics is likely to be affected by the chance proportion of recovery periods to recession periods included in the study, and significant positive relationships in one period may be canceled by negative ones in another. (2) Winter wheat prices

in certain months are so predominantly strong or weak, depending upon whether they are in uptrend or downtrend phases of the wheat-price cycle, that month-to-month price changes in their case are some indication of current position in the cycle. (3) Certain seasonal price movements covering several months correlate to a high degree with longer time cyclical trends and are, therefore, an additional basis for judging price trends for a more extended period. (4) With respect to the extent that volume of trading and size of open interest correlate with price, future trading is so different in different phases of the wheat-price cycle as to give some suggestion of current position in the cycle. (5) Cash-future, intragrade, and intermarket price spreads to some degree differ enough in uptrend and downtrend phases of the wheat-price cycle as to be worth looking to for additional confirmation or disapproval of judgment. (6) In certain strategic months, persistent daily price movements in a given direction are of some value in judging current position in the wheat-price cycle. (7) Recurrent lows and highs for hard winter wheat prices are made in rather restricted seasons. There is some danger, therefore, of making turning points less evident by statistically removing seasonal variation when the attempt is being made to locate turning points in particular price cycles. The relative value of top and bottom No. 2 hard wheat price quotations at Kansas City in indicating cyclical turning points varies with the development of different phases of the wheat-price cycle. (8) From the standpoint of market performance and market psychology, the uptrend and downtrend phases of a wheat-price cycle are so different in pattern as to warrant separate treatment in making mathematical measurements of relationships and central tendencies. They are more logical units for market-price analysis than are calendar years, crop years, six-month periods, five-year averages, and the like. (9) Price analysis—starting with prices as they are; recognizing the most patent fact with regard to them, namely, their alternate up-and-down movement; and reasoning backward and forward from current prices on the basis of what character of price movements takes place in certain institutional environments—better permits a ready adaptation of economic theory to price-problem research than does equilibrium analysis."

Some findings in the study were as follows: Monthly winter wheat price advances from July to October and from February to May are much more closely associated with the upward than the downward trend of the wheat-price cycle, and consequently these months are the statistical months for observing the month-to-month changes that are indicative of any cyclical change in the direction of prices. In about 74 percent of the cases where daily volume of trading in wheat futures exceeded 75 percent of the open-market interest for the day, lower prices prevailed by the end of the next 30 days. Since 1919 the spread between the prices of export type and mill type of No. 2 hard wheat at Kansas City widened most often with the cyclical uptrend of prices. The Kansas City-Chicago intermarket price spread varied only in a restricted way with uptrend or downtrend phases of the wheat-price cycle. Persistent daily price movements of the top cash price of No. 2 hard winter wheat at Kansas City in September, February, and March are highly indicative of the position in the wheat-price cycle. The monthly top for top No. 2 hard winter wheat at Kansas City was reached between April and September in 11 of the 12 cycles studied, and the monthly low for low No. 2 was reached between the same months in 10 of the 12 cycles. In the case of both, all cyclical highs were between January and June.

Wheat prices and the acreage of wheat in Great Britain, K. A. H. Murray and R. L. Cohen (*Scot. Jour. Agr., 18 (1935), No. 4, pp. 354–363, figs. 2*).—Anal-

ysis is made for the periods 1904–14 and 1924–34 of the relationship of wheat prices and purchasing power of wheat in the autumn to the acreage planted to wheat that autumn and the succeeding autumn.

A rise or fall of 10 points in the purchasing power of wheat raised or lowered the acreage of the next crop but one by 97,780 acres in the pre-war period and 95,320 acres in the post-war period.

The marketing of country-dressed meat in Portland, B. W. RODENWOLD, A. W. OLIVER, and E. L. POTTER (*Oregon Sta. Bul. 339 (1935), pp. 22, fig. 1*).—This study, undertaken to determine the extent to which country-dressed carcasses enter into the Portland trade, the quality of such meat, the trade practices of dealers and agencies handling such carcasses, the relative prices received by farmers for live animals and farm-slaughtered meat, and the economic importance of the farm-slaughtered meat trade, is based largely on records of the State Department of Agriculture and the Portland Health Service.

Four percent of the cattle, 83 percent of the calves, 11 percent of the hogs, and 27 percent of the sheep and lambs used in Portland for meat are shipped in as country-dressed carcasses. Nearly all retail and wholesale dealers buy such meat, especially veal. Due to the types of animals slaughtered on farms, the quality of such meat, except veal, is usually lower than that from other sources. Unskilled butchering and lack of cooling facilities detract from the value of country-dressed meat. Methods of wrapping and shipping are open to criticism. There are no recognized grades for such meat. Sales of similar animals alive and as carcasses indicate the former method gives the higher returns to producers, provided they are able to get truck or carload rates on the live animals.

The development of the market for beef in Great Britain, K. A. H. MURRAY and J. A. S. WATSON (*Empire Jour. Expt. Agr., 3 (1935), No. 10, pp. 169–173, fig. 1*).—The changes in home supply, imports, demand, prices, consumers' purchasing power, consumers' preferences for different meats, etc., are discussed.

The agricultural marketing acts and schemes, N. E. MUSTOE (*London: Estates Gaz., Ltd., [1935], pp. XIV+440*).—"The object of this book is to bring together the statutes, orders, regulations, and cases relating to the marketing of agricultural products, and to set out the schemes of agricultural marketing which are now in operation in England. . . .

"The introduction gives a summary of the economic tendencies in agricultural cooperation and a résumé of the acts themselves."

Fifteenth annual market review, 1934 (*Canada Dept. Agr., Livestock Branch, Ann. Market Rev., 15 (1934), pp. 168, [figs. 3]*).—This publication reviews and analyzes the sales, prices, trading, etc., in respect to cattle, beef, hogs, bacon, sheep, and lambs at Canadian markets and in the British Isles, United States, Australia, South America, and Europe, and the output of livestock in the different provinces of Canada.

Car-lot shipments of fruits and vegetables from stations in the United States for the calendar years 1932 and 1933, compiled by L. NORGREN (*U. S. Dept. Agr., Statis. Bul. 50 (1936), pp. 150*).—This bulletin supplements Bulletin 42, previously noted (E. S. R., 70, p. 554), and is based on monthly mail reports covering 43 fresh fruits, vegetables, melons, mixed citrus and deciduous fruits, and mixed vegetables, furnished by about 8,000 local agents of transportation companies.

RURAL SOCIOLOGY

Social adjustment in an agricultural community adjacent to a large city ([*Connecticut*] *Storrs Sta. Bul. 207 (1935), pp. 30, 31*).—Some of the findings in an analysis of the residential movements and vocational backgrounds of all households in Windsor, Conn., are given.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

A manual of group discussion, L. S. JUDSON (*Illinois Sta. Circ. 446 (1936), pp. 184*).—This manual was prepared to assist in the organization and conducting of rural discussion groups. The parts deal with what group discussion is, organizing the discussion meeting, the chairman and his job, the member and his responsibilities, priming the group discussion pump, discussion team exchanges and tournaments, preparing your speech, and practicing and delivering your speech.

An appendix includes a brief statement as to how to get material for discussion topics, suggested rules for a discussion team tournament, fundamentals of parliamentary law, aids for guides and experienced members, and a list of references on discussion methods.

Arithmetic in agriculture and rural life, C. A. WILLSON (*Ann Arbor, Mich.: Edwards Bros., 1935, 3. ed., pp. VIII+160, [figs. 25]*).—This book is designed to serve as a textbook and reference and source book for farmers and students of agriculture. The more than 600 problems included cover the field of arithmetic and are based on research and experiments of the agricultural colleges and experiment stations of the United States.

Motion pictures of the United States Department of Agriculture, 1935 (*U. S. Dept. Agr., Misc. Pub. 227 (1936), pp. III+38*).—This is a classified list with descriptions of the films that may be purchased or borrowed from the Department.

FOODS—HUMAN NUTRITION

Food studies [by the Nebraska Station] (*Nebraska Sta. Rpt. [1935], pp. 20, 21*).—Brief summaries are given of studies on the cooking quality of Great Northern and navy beans, the comparative costs of home and commercially prepared bread, and the use of lard in making cake, with the preferences of Nebraska homemakers for various shortening agents.

The story of oysters, R. H. FIELDER (*U. S. Dept. Com., Bur. Fisheries, Fishery Circ. 21 (1936), pp. [2]+29, figs. 21*).—This is a compilation of information from various sources, including other publications of the Bureau, on the oyster—its biology, culture, enemies, the oyster fishery and industry, sanitary regulations, food value, and selected recipes.

Study of the calcium and phosphorus in cheeses [trans. title], G. GUITTONNEAU and R. CHEVALIER (*Ann. Falsif., 28 (1935), No. 323, p. 562*).—Attention is called to an error in certain data reported in the paper under the same title (E. S. R., 74, p. 274).

The effect of freezing on the physical and microscopic character of gels of corn and wheat starches, S. WOODRUFF and H. HAYDEN (*Jour. Agr. Res. [U. S.], 52 (1936), No. 3, pp. 233–237, pls. 2*).—In this investigation at the Illinois Experiment Station, 5 percent gels prepared at temperatures from 70° to 95° C. from the starches of three varieties of corn and of wheat by methods described in a previous paper (E. S. R., 70, p. 124) were frozen at —2° to —3° and also at the temperature of solid carbon dioxide, and the frozen gels com-

pared after thawing at room temperature with the unfrozen gels in gross and microscopic appearance.

In gross appearance the gels frozen at the higher temperatures were very different from the unfrozen. The cornstarch gel prepared at 95° and frozen at temperatures no lower than —2° or —3° became coarsely fibrous and sponge-like, in that water could be pressed from it without loss of shape and after drying the gel absorbed water very readily. The freezing and dispersing could be repeated a number of times without noticeable loss of power to form a gel. When frozen in solid CO_2 the gel changed but little in gross appearance, acting in practically every way like the original gel. Wheat starch gels frozen in the refrigerator were fibrous like the cornstarch gels, but the sponge was not as tough and water could not be squeezed out as completely.

Microphotographs of the frozen starches showed changes similar to those observed on gross examination. In those frozen in the refrigerator veined areas appeared which were particularly marked in the cornstarch gels. These areas were not noticeable in the gels frozen at the lower temperature.

Attention is called to the fact that the greater change in both gross and microscopic appearance at —2° to —3° than at lower temperatures is in accord with work reported by Katz on bread staling. "The staling process which is concerned with changes in starch was found by him to pass through a maximum value at —2° to —3°, when bread was stored at temperatures varying over a wide range."

Culinary quality of potatoes, M. A. BARMORE (*Colorado Sta. Rpt. 1935, pp. 23, 24*).—This progress report discusses attempts to devise satisfactory tests for judging the culinary quality of potatoes.

Making and using peanut butter, W. R. BEATTIE (*U. S. Dept. Agr. Circ. 384 (1936), pp. 14, figs. 7*).—This circular describes, with photographs and diagrams, the various steps in the commercial manufacture of peanut butter, outlines a simple process for making it on a small scale in the home, describes its food value, and gives recipes showing a wide range of uses of both the commercial and homemade product.

The influence of various factors, including altitude, in the production of angel food cake, M. A. BARMORE (*Colorado Sta. Tech. Bul. 15 (1936), pp. 54, figs. 30*).—This bulletin gives the technical details and discusses the theoretical aspects of the investigation, the practical applications of which have been noted in a previous bulletin (E. S. R., 73, p. 871).

Among the various factors discussed in their bearing on the quality of angel food cake baked at any given altitude are variations in mixing methods, the function of added acid (such as cream of tartar), variations in baking temperature, the age of the eggs, and variations in the proportion of flour to sugar. The effects of change of altitude on the expansion of the batter, the amount and rate of evaporation, the maximum internal temperature, the volume of the escaping vapor, and the color of the crust are also discussed. The various steps in the derivation of the baking formula are presented, and the changes in recipes for various altitudes are illustrated by a three dimensional plot.

"Although the recipes for angel food cake have a great practical value, the author feels that the most valuable result of the work is the finding that this type of flour mixture yields to investigation, and that the recipe conforms to a systematic scheme and is not a 'hit or miss' proposition as formerly supposed. This result gives hope of proving that the more complex types of flour mixtures conform to some definite order."

Microbiological examination of dried foods, J. A. CLAGUE and J. E. FULLER (*Jour. Bact., 31 (1936), No. 1, p. 86*).—In this abstract of a report from the

Massachusetts Experiment Station, it is noted that tests conducted with a small tunnel drier showed that artificial drying effectively eliminated yeasts and materially reduced the number of bacteria and molds on dried fruits, but that the reduction of micro-organisms on vegetables during the drying process was not as marked as with fruits. It is concluded that "the methods used in the commercial dehydration of foods should produce a safe product, especially when it is considered that most of these foods are cooked before being consumed."

Human calorimetry, II, III (*Jour. Nutr., 9 (1935), No. 3, pp. 261–300, figs. 7*).—In continuation of the series of papers noted previously (E. S. R., 74, p. 891), two papers are presented.

II. *The average temperature of the tissues of the body*, A. C. Burton (pp. 261–280).—This paper reports a statistical examination of the possibility of using the surface temperature of the body as well as the rectal temperature in calculating the average temperature of the body. A theoretical equation was first derived for combining rectal and surface temperatures to give the true average, and from the results of 40 1-hr. periods with the respiratory calorimeter described in the first paper upon a group of subjects in basal and absorptive conditions the formula giving the least average discrepancy between direct and indirect heats was found experimentally. This formula is: Average temperature=0.65×rectal temperature+0.35×average surface temperature.

The average surface temperature is determined from measurements over the trunk, the lower leg, and the forearm. Results obtained by the experimental equation were found to agree closely with those calculated from the theoretical equation. By its use the average error is reduced from 7.5 percent as obtained by using the rectal temperature alone to 5.5 percent.

III. *Temperature distribution, blood flow, and heat storage in the body in basal condition and after ingestion of food*, A. C. Burton and J. R. Murlin (pp. 281–300).—The heat production, heat elimination, and rectal and surface temperature changes of 10 adult subjects were studied in the respiration calorimeter in basal condition and after the ingestion of meals consisting mainly of carbohydrate or of protein.

On the average, heat elimination exceeded heat production by 13 percent in the first basal hour and 9 percent in the second. At first the fall in body temperature was uniform for surface and rectal measurements, but later the surface temperature fell to a much greater extent than the rectal temperature. After the meal heat was first stored in the body by a general rise of temperature, but later the surface temperature rose much more than the rectal temperature, with resulting increase in radiation from the body and elimination of extra heat. By the use of the thermal circulation index, increased circulation was found to be general and to commence 20 min. after the ingestion of food, with similar effects for protein and solid and liquid carbohydrate. "There is no evidence of a withdrawal of blood from the somatic tissues to the visceral, but a definite general increase in circulation, which may well be due to the same factors as cause the specific dynamic action."

A statistical study of the metabolism of the fasting albino rat, J. C. Krantz, Jr., and C. J. Carr (*Jour. Nutr., 9 (1935), No. 5, pp. 563–567, fig. 1*).—Data are summarized on the heat production and respiratory quotient of 92 fasting rats, as determined by the Haldane open circuit apparatus with certain modifications.

The mean heat production was 1,040 calories and the mean respiratory quotient 0.725. An examination of the frequency distribution of the respiratory quotients showed that the median value was practically identical with the mean, and that the modal series fell within 0.72 and 0.729.

Utilization of gelatin, casein, and zein by adult rats, I. D. MASON and L. S. PALMER (*Jour. Nutr., 9 (1935), No. 4, pp. 489–505*).—In this comparison the percentage retentions of nitrogen calculated by the McCollum method (E. S. R., 27, p. 172) averaged 74 percent for casein, 23 percent for gelatin, and 57 percent for zein. Gelatin and casein were so completely digested that there was no significant difference between the percentage retentions and the biological values calculated by the Mitchell method (E. S. R., 51, p. 407). Zein, however, showed a very poor and variable digestibility, with exogenous nitrogen ranging from 4 to 36 percent of the ingested zein and biological values ranging from 18 to 72, with an average of 45.

A highly significant correlation was found in the zein figures and later substantiated by similar treatment of data reported from Mitchell's laboratory for other materials, between the exogenous fecal nitrogen expressed as the percentage of nitrogen ingested and the exogenous urinary nitrogen expressed as the percentage of nitrogen resorbed. In an attempt to explain this correlation, further experiments were carried out on rats with known efficiency indexes for growth (E. S. R., 65, p. 690), but no relation was found between the inherent efficiency of the animals and the digestibility or utilization of the zein. Analysis of undigested zein residues for nitrogen distribution likewise furnished no explanation of the correlation between the food wastage in the feces and that in the urine.

Children's feeding problems in relation to the food aversions in the family, D. MCCARTHY (*Child Devlpmt., 6 (1935), No. 4, pp. 277–284*).—The subjects in this study of the psychological factors underlying children's feeding problems were 48 children between the ages of 2 and 7.5 yr., some of whom were enrolled in the nursery school of the University of Georgia while the others had previously attended or were brothers or sisters of children attending the school. The children came from 34 different families. The feeding-problem group was composed of 6 boys and 8 girls averaging 58.6 mo. of age, and the remaining group of 15 boys and 19 girls averaging 50.4 mo. The data were secured by interviewing the mothers as to the attitude of the children toward 72 foods commonly served in the locality.

Feeding practices in the two groups differed in that the children in the problem group received a greater variety of foods and were in general offered many more carbohydrate foods and fewer eggs and fruits. The problem group showed a much lower percentage of liked foods with a correspondingly higher percentage of foods to which they were indifferent or which they disliked or refused. No generalization could be drawn concerning the kinds of food preferred by the two groups. With increasing age, strong likes and dislikes tended to change to a growing indifference for food, which was more marked in the problem group than the nonproblem group.

Food aversions on the part of members of the family were associated with about 35 percent of the children's food aversions, but there was a much higher percentage of identical food aversions among brothers and sisters than between children and parents. This is thought to be in harmony with the belief that social imitation is most effective among individuals of similar ages. "It is probably also one of the major reasons for the rather uniformly high degree of success of nursery schools in dealing with feeding problems, since they represent a situation in which opportunity for favorable example in eating habits is afforded from other children of similar age."

Vitamin values of some varieties of apples, E. N. TODHUNTER (*Better Fruit, 30 (1936), No. 7, pp. 10, 11, figs. 2; also in Wash. State Hort. Assoc. Proc., 31 (1935), pp. 43–47*).—This paper summarizes recent studies at the State College of Washington on the influence of variety, storage, fertilization of the

tree, leaf: fruit ratio, cooking, and other factors on the vitamin C content of several varieties of apples grown in the State, and discusses other facts concerning the nutritional value of apples.

According to the tabulated data, the number of fresh apples required daily to protect man from scurvy is estimated to be about 2 of the Winesap variety for fertilized trees and 2½ for unfertilized, 3 of the Golden Delicious, 5 of Delicious and Richared, and 6 of the Jonathan variety. No loss in potency of the Delicious or Richared apples could be detected after 6 months' storage at 32° F., but at 45° or common storage the same varieties lost about one-sixth of their vitamin C value in 3 mo., one-fourth after 6 mo., and one-half after 1 yr. Winesaps grown on trees of low (10:1) leaf: fruit ratio had a higher content of vitamin C than those grown on trees of a higher (50:1) ratio. The smaller size of the apples of low leaf: fruit ratio with a correspondingly larger amount of peel of higher vitamin C content is thought to explain the difference in potency. From the standpoint of vitamin C, it is recommended that the peel of the apple be eaten and that a medium or small-sized apple be chosen in preference to a large one.

It is noted briefly that apples compare favorably with other fruits as a source of vitamin A, and that the peel of the Richared has been found to contain approximately 5 times as much vitamin A as the flesh.

The vitamin content of Sultanina (Thompson seedless) grapes and raisins, A. F. MORGAN, L. KIMMEL, A. FIELD, and P. F. NICHOLS (*Jour. Nutr., 9 (1935), No. 3, pp. 369–382*).—This paper and the two which follow report the details of studies in continuation of the extensive investigation of the effect of various methods of drying on the vitamin content of California fruits. Brief summaries of several of the studies and the practical conclusions of the investigation as a whole have been noted previously (E. S. R., 73, p. 713).

Thompson seedless grapes tested when fresh were found to be richer in vitamin A than had hitherto been reported. "The fresh grapes appeared to contain 1 international unit (allowing 6 to 8 g gain per week for 8 weeks) in 2 g." The grapes preserved by freezing storage lost about 50 percent of their vitamin A content even after air evacuation. None of the sun-dried raisins prepared from these grapes contained appreciable amounts of vitamin A, but "the dehydrated raisins, both sulfured and unsulfured, retained this factor in full, 1 international unit in 0.5 g. All the sun-dried raisins had lost most of the vitamin A activity."

For the vitamin B (B_1) tests both rat growth and pigeon maintenance methods were used. The fresh frozen grapes were distinctly inferior in vitamin B value to similar grapes purchased 2 or 3 times a week on the local market. "The fresh grapes contain 1 Sherman unit in 3 g or 1 international unit in 4 g." The best retention of the original vitamin B was shown by the soda-dipped sun-dried raisins, with nearly as good retention, 56 and 60 percent, by the dehydrated dipped and the natural undipped sun-dried raisins. Treatment of the fruit with SO_2 previous to drying resulted in almost complete loss of the vitamin B, as shown by the rat-growth test, and somewhat smaller loss, as shown by the pigeon test.

Fresh grapes contained very little vitamin C and frozen grapes and raisins afforded no protection. The vitamin G experiments were inconclusive, although the authors are of the opinion that "vitamin G appears to be poorly represented in grapes and raisins."

The vitamin content of figs, A. F. MORGAN, A. FIELD, L. KIMMEL, and P. F. NICHOLS (*Jour. Nutr., 9 (1935), No. 3, pp. 383–394*).—The conclusions concerning the vitamin A and C content of fresh and dried figs have been noted [illegible]

viously from an earlier report (E. S. R., 67, p. 776). The results for vitamins B (B_1) and G are summarized as follows:

"Fresh Kadotas and Adriatics contained about equal amounts of the vitamin, 25 international or 35 Sherman units per 100 g. The unsulfured dried Adriatics retained 61 percent of this and all sulfured products 37 percent or less, that is 71 and 33 Sherman units per 100 g of dried fruit. . . . Vitamin G is present in figs, the dried products containing practically the same amount in all cases, 33 to 50 Sherman units per 100 g. None of the variables of the drying process appeared to affect this vitamin."

The vitamin B and G content of prunes, A. F. MORGAN, M. J. HUNT, and M. SQUIER (*Jour. Nutr., 9 (1935), No. 4, pp. 395–402, figs. 2*).—The prunes used in this study were of medium size (California origin) purchased on the open market. The vitamin B (B_1) content of the dried prune flesh determined by the Chase and Sherman method was from 80 to 100 units per 100 g. When a liver extract was substituted for autoclaved yeast as the source of vitamin G (B_2), growth took place at a lower rate, suggesting the possibility of a third vitamin B factor present in the yeast but not in the liver extract.

In the vitamin G tests the method of Bourquin and Sherman was used, except that a potent rice polish extract made according to the technic of Evans and Lepkovsky (E. S. R., 65, p. 613) replaced an extract of wheat as the source of vitamin B (B_1). The vitamin G content of the prunes as thus determined was very high, values of 2.8 and 4 Sherman units per gram being obtained. Other materials tested for comparison gave the following values: Wheat germ 4.1 and 3.7, dried whole eggs 4.5, dried whole milk 5.6 and 4.1, dried spinach 9.9 and 8.2, dried brewery yeast 19.5 and 14.2, and dried beef liver 15 and 15.8 Sherman units per gram.

Vitamins retained in sulfured and unsulfured dried fruits, A. F. MORGAN (*Med. Woman's Jour., 43 (1936), No. 1, pp. 14–16, 24*).—This paper is based upon the various studies reported in detail in the papers noted above.

Crystalline vitamin B_1, H. W. KINNERSLEY, J. R. O'BRIEN, and R. A. PETERS (*Biochem. Jour., 29 (1935), No. 3, pp. 701–715, figs. 2*).—In this report certain discrepancies between the properties of crystals with vitamin B_1 activity isolated by the authors and by other investigators (E. S. R., 70, p. 153) are discussed, and the conclusion is drawn that "there is now no valid reason for questioning the view that vitamin B_1 has been isolated, though certain details have not yet been settled." The details refer chiefly to questions connected with the formula of the vitamin. Data illustrating certain discrepancies are given on the preparation of various salts of the vitamin, analyses and possible empirical formulas, biological tests with crystalline preparations (including curative pigeon tests), the catatorulin test by a modification of the method of Passmore et al. (E. S. R., 71, p. 7), and growth tests on young rats. The problem of Reader's vitamin B_4 is also discussed, but with no very definite conclusions beyond the belief that in the evidence presented by Reader for a separate vitamin B_4 two factors rather than one are indicated.

The report contains as appendixes tabulated analyses by Kinnersley and O'Brien of vitamin B_1 hydrochloride and notes by Peters on the catatorulin test.

Investigations on the vitamin B_2 complex, I–III, P. GYÖRGY (*Biochem. Jour., 29 (1935), No. 3, pp. 741–775, figs. 18*).—Three papers are presented.

I. *The differentiation of lactoflavin and the "rat antipellagra" factor* (pp. 741–759).—A preliminary report of this investigation has been noted previously (E. S. R., 72, p. 282). The paper is of special significance in showing that with a crystalline or highly purified preparation of vitamin B_1 as a supple-

ment to a vitamin B-free basal diet a pellagra-like condition is produced in rats almost without exception, and that the further addition of lactoflavine does not affect the result, showing that the flavine has no connection with the pellagra-like dermatitis of rats.

Uncertainty in the experimental production of pellagra-like dermatitis on a diet such as that of Bourquin and Sherman (E. S. R., 66, p. 410) is attributed to the presence of the supplementary factor B_6 in the alcoholic extract used as the source of vitamin B_1. "Accordingly it is recommended that if a crystalline, or similarly well-characterized and highly purified preparation of vitamin B_1, can be obtained, the diet of Bourquin and Sherman should be dispensed with in experiments of which the purpose is the study of pellagra-like dermatitis. In addition to this, it must be borne in mind that yet other unknown components of the vitamin B complex may be present in the alcoholic wheat extract."

Peters' "charcoal eluate" from yeast prepared as described by Kinnersley et al. (E. S. R., 70, p. 153) is recommended as a suitable source of vitamin B_6 free from lactoflavine. With any two of the three factors—crystalline vitamin B_1, pure flavine, and Peters' eluate—growth of rats is not obtained until the third factor is supplied. The pellagra-like symptoms are produced only in the absence of vitamin B_6.

The data reported are discussed in considerable detail with reference to the interpretation of the apparent discrepancies among the views previously held by various investigators, and to the possible clinical significance of the differentiation of the vitamin B_2 complex. "The systematic investigation of the vitamin B_2 complex does not form an end in itself. The clinician will view this analysis as only the first step essential for the better understanding of the relationship between the individual representatives of the vitamin B_2 complex and the corresponding specific diseases in man. Now that the separation of the pellagra-preventing substance (vitamin B_6) from lactoflavine has been accomplished, the problem of the prevention of human pellagra will have to be subjected to a new experimental investigation. In this respect nutritive products will be considered according to their content of vitamin B_6 and not as hitherto according to their total vitamin B_2 content."

II. *The distribution of lactoflavin and of the "pellagra-preventing factor" (vitamin B_6) in natural products of animal origin* (pp. 760–766).—A number of animal food products have been tested for their content of lactoflavine and vitamin B_6. In the first experiment young rats were fed a basal diet devoid of the B vitamins and supplemented only with crystalline vitamin B_1, 3–4 pigeon units daily, and the material to be tested. After the weight had become stationary subsequent to initial gains continuing for from 6 to 8 weeks, one-half of the animals were given 10γ of lactoflavine or from 3 to 5 cc of egg white daily and the other half vitamin B_6 in the form of Peters' eluate from bakers' yeast equivalent to 10 g of the fresh yeast. In later work two groups of animals were given lactoflavine and Peters' eluate, respectively, together with crystalline vitamin B_1 from the beginning of the experiment, and the material to be tested was given after cessation of weight gains. In the tests for lactoflavine, growth was used as the criterion and in those for vitamin B_6 the cure of pellagra-like dermatitis.

As thus determined, 0.75 g of heart muscle, 2 g of veal, and 3 g of beef contained 1 rat day dose of lactoflavine, while in their curative effects on dermatitis 0.75 g of heart muscle, from 0.6 to 0.75 g of veal, and 1 g of pork were of equal value. Fish muscle contained insignificant amounts of lactoflavine but was very rich in vitamin B_6, in contrast with egg white, which contained negligible amounts of vitamin B_6 but was rich in lactoflavine.

suggested that in the absence of artificial preparations of lactoflavine and of vitamin B_6 egg white and fish muscle may be used as sources of lactoflavine and vitamin B_6, respectively.

The numerical results of various tests are summarized in terms of the number of grams required to furnish 1 rat day dose. For lactoflavine some of the values are beef liver 0.2 g, beef heart muscle 0.75, veal 2, beef muscle 3, leg of chicken 3, breast of chicken 3–4, chicken gizzard 3–4, fish liver (cod) >3, and salmon, herring, and haddock muscle >3 g. For vitamin B_6 the values are beef liver 0.3 g, salmon, herring, and haddock muscle 0.5, veal 0.75, heart muscle (beef) 0.75, beef muscle 1, leg and breast of chicken 1, chicken gizzard 2, fish liver (cod) 2, and egg white >10 g. The values for milk were 10 cc for both lactoflavine and vitamin B_6.

III. *The inactivation of lactoflavin and vitamin B_6 by visible light* (pp. 767–775).—Earlier studies leading to the conclusion that vitamin B_2 (complex) can be inactivated with visible light have been extended to the constituents of the complex, lactoflavine and vitamin B_6, with the finding that both of the constituents are sensitive to visible light. The results of Hogan and Richardson (E. S. R., 69, p. 152) on the destruction of the pellagra-preventing substance in yeast or liver by ultraviolet light were also confirmed.

Flavin and the pellagra-preventing factor as separate constituents of a complex vitamin B_2, L. J. HARRIS (*Biochem. Jour., 29 (1935), No. 3, pp. 776–781, figs. 3*).—Data are reported in confirmation of the above-noted work by György differentiating vitamin B_2 into flavine and the antipellagra fraction. A plea is made for the retention of the term vitamin B_2 for the complex, with the suggestion that flavine might be designated as BF and the pellagra-preventing factor BP. Attention is called to the probability that the international activated acid clay vitamin B_1 standard is contaminated with the antipellagra vitamin and possibly with other B factors.

Effect of deficiency of vitamin B complex on the "redox" system in the eye-lens, S. N. RAY, P. GYÖRGY, and L. J. HARRIS (*Biochem. Jour., 29 (1935), No. 3, pp. 735–740*).—A new technic is described for the chemical determination of vitamin C in very small amounts of material by titration with 2,6-dichlorophenolindophenol solution and back-titration with a solution of pure ascorbic acid. The method has been found applicable to the determination of the indophenol-reducing capacity of the lens of a single rat, the error of determination being within ±10 percent.

In an attempt to correlate the observations of various investigators concerning the presence of vitamin C in the normal lens of the eye, its absence in the cataractous lens, and the production of cataract in rats on a diet deficient in vitamin B_2, groups of rats were kept on diets lacking in one or more of the vitamins of the B group until characteristic lesions developed and were then killed and their lenses examined for vitamin C. The vitamin C content of the lenses of rats kept on diets partially or completely deficient in the vitamin B complex was very low, although other tissues such as the liver or kidneys of the same animals contained normal amounts of the vitamin. In extreme cases extracts of the lens instead of showing a reducing capacity actually oxidized ascorbic acid. The loss of reducing power could not be traced to lack of any known constituent of the vitamin B complex. Raw egg white administered in daily doses of 5 cc had a strong prophylactic and curative action.

It is also noted briefly that, although the vitamin C content of the scorbutic guinea pig lens is much lower than that of the normal animal, an appreciable amount (about 0.2 mg per gram) remains even in acute scurvy. Preliminary tests with the back-titration method have shown the presence

of an oxidizing agent similar to that found under certain conditions in the lens.

Blood pyruvate in vitamin B_1 deficiency, R. H. S. THOMPSON and R. E. JOHNSON (*Biochem. Jour., 29 (1935). No. 3, pp. 694–700. fig. 1*).—In extension of previous work dealing with pyruvic acid as a possible tissue metabolite (E. S. R., 73, p. 724), the bisulfite-binding capacity of the blood of normal and B_1-avitaminous pigeons and rats was investigated. Abnormally large amounts of bisulfite-binding substances were found to be specifically related to vitamin B_1 deficiency and not to accompanying starvation. The question is raised as to whether this increase in blood pyruvic acid is due to metabolic differences in the brain alone or is a reflection of a general lesion throughout the tissues. The latter is thought to be the more plausible. The possibility is suggested of the clinical application of the determination of the bisulfite-binding capacity as a test for vitamin B_1 deficiency.

The vitamin C requirement of the guinea pig, M. DANN and G. R. COWGILL (*Jour. Nutr., 9 (1935), No. 4, pp. 507–519, fig. 1*).—In this attempt at establishing the relationship, if any, between body size and vitamin C requirement of the guinea pig, 80 animals of various sizes selected more or less at random at different periods of the year were fed Eddy's modification (E. S. R., 62, p. 607) of the Sherman-La Mer scorbutic diet supplemented with individual limited doses of fresh decitrated lemon juice for 14 days, or in a few instances 11 days. At the end of this time the animals were chloroformed and the lower jaws quickly dissected out and placed in 8–10 percent formalin for examination of sections of the incisor roots by a method differing somewhat from the original one of Höjer (E. S. R., 57, p. 295) and later modifications, but revealing the same changes. Diagnosis of the extent of vitamin C protection was made with the 0 to 4 scale of Key and Elphick (E. S. R., 67, p. 189).

In plotting the data with abscissas representing the vitamin C dosage and ordinates the body weight, the locations of the points representing complete protection were found to indicate a definitely linear relationship between the weight of the animal and the dose of lemon juice required for complete protection. The protective dose, almost exactly 1 cc per 100 g body weight, confirmed the observations of Goettsch (E. S. R., 60, p. 691), Eddy, and other investigators for guinea pigs of about 30 g body weight. The data thus give no evidence that the young, rapidly growing animal requires a proportionately greater amount of vitamin C than the adult. There is likewise no evidence that the metabolic rate, which in the case of vitamin B was found to be as important as body weight in determining the requirement of various species, is of any significance as far as vitamin C is concerned.

A preliminary note on the appearance of paresis in adult rats suffering from chronic avitaminosis E, A. RINGSTED (*Biochem. Jour., 29 (1935), No. 8, pp. 788–795, pl. 1, fig. 1*).—This paper describes in detail, with photographs, a form of paresis which has been observed in adult rats kept for a long time on a diet of very low vitamin E content. The neuropathic disturbances show a general similarity, but with certain differences, to the phenomenon in suckling rats from mothers on a diet low in vitamin E, as described by Evans and Burr (E. S. R., 58, p. 791), and an even greater similarity to those described by Aberle (E. S. R., 73, p. 276) as occurring in rats suffering from vitamin A deficiency. However, various symptoms were not alike in the two conditions, and the paresis in the present study is not cured by large doses of vitamin A. The clinical phenomena of the skin and nervous system do not resemble those of experimental beriberi or rat pellagra, and lack of vitamin A and D can be ruled out.

Dietary standards for the adult dental patient, D. F. RADUSCH (*Jour. Amer. Dental Assoc., 22 (1935), No. 10, pp. 1645–1656*).—This discussion of dietary standards for adults has been prepared for use by dentists in determining how nearly the patient's daily diet conforms to accepted standards. Concerning the relation of the dentist to the physican in dietary advice, the opinion is expressed that "since special diets must be based on certain medical diagnosis, the dentist's interest should be confined to determining how nearly the patient's daily diet conforms to accepted standards. If such a study indicates definite deviations from accepted standards, the patient should be instructed as to needed adjustments, taking cognizance of the medical history, that is, when definite systemic conditions (diabetes, nephritis, etc.) are present all dietary advice should be supervised by the physician. With the large percentage of persons on diets inadequate by comparison to even minimal and not optimal dietary standards, the dentist is justified in teaching his patients to approximate known standards, for good nutrition is one of the basic rules of hygiene."

TEXTILES AND CLOTHING

Classification, grades and uses of wool, M. B. PORTS (*U. S. Dept. Agr., Bur. Anim. Indus., Anim. Husb. Div., A. H. D. No. 13 (1935), pp. 6*).—The author gives the grade names and describes the numerical grades of wool as used in the English system of grading and shows how they compare with the grades used by the wool trade in the United States. The classification of wool from the manufacturing standpoint is also described. A brief discussion is given of the preparation of wool for cloth, the grades of wool produced by the more common breeds of sheep, and the uses of the various grades of wool.

HOME MANAGEMENT AND EQUIPMENT

[Factors that determine standards of living in Connecticut farm homes] (*[Connecticut] Storrs Sta. Bul. 207 (1935), pp. 29, 30*).—This progress report summarizes the more important findings in an analysis of the use of income in 119 farm homes in the eastern highland of Connecticut.

Home equipment [studies by the Nebraska Station] (*Nebraska Sta. Rpt. [1935], pp. 19, 20*).—In this progress report the results are summarized of the performance of surface burners and ovens in six types of gas stoves, and the purpose and preliminary findings are given for a study of the accuracy of pressure gages, both new and old, in steam pressure cookers.

MISCELLANEOUS

Forty-eighth Annual Report of the Colorado Agricultural Experiment Station, [1935], E. P. SANDSTEN (*Colorado Sta. Rpt. 1935, pp. 36*). —The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Report of the director [of the Storrs Station], 1935, W. L. SLATE (*[Connecticut] Storrs Sta. Bul. 207 (1935), pp. 56*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fifteenth Annual Report [of the Georgia Coastal Plain Station], 1935, S. H. STARR (*Georgia Coastal Plain Sta. Bul. 25 [1935], pp. 112, figs. 14*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Meteorological data are also included.

Forty-ninth Annual Report of [Nebraska Station, 1935], W. W. BURR (*Nebraska Sta. Rpt. [1935], pp. 43*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

California Station.—Dr. J. A. Howarth, associate in veterinary science since 1928 at Davis, died May 15 as a result of an automobile accident. Dr. Howarth was born in Philadelphia in 1893 and received from the Kansas College the B. S. A. degree in 1921 and the D. V. M. degree in 1923. From 1923 to 1928 he was connected with the Washington College.

Georgia Station.—Labor and some material for the construction of soil plats, separated by concrete walls, have been supplied by the U. S. Works Progress Administration, aiding greatly in supplying uniform conditions for some of the soils projects now in progress.

Kansas College and Station.—Because of lack of facilities a limitation to 200 of the number of students who may enroll in the last 4 yr. of the course in veterinary medicine has been set. Reductions will be made on a scholarship basis, preference then accruing to residents of the State and next to residents of States having no standard veterinary college.

Dr. Walter E. King, professor of bacteriology and bacteriologist from 1907 to 1910, and subsequently in commercial research, died in Detroit, Mich., May 2 at the age of 59 yr.

Maryland University.—Plans looking toward the establishment of an Institute of Transport have been announced. A collection of books on highway education, now located at the University of Michigan, and an exhibit of road-making machinery and models have been contributed by their owner, Dr. Charles Henry Davis, who is also undertaking to raise through private sources a fund of $500,000 for a museum building which will serve temporarily as an administration building for the institute. The program contemplates the ultimate establishment of 21 units on the campus at a cost of approximately $10,000,000. The primary purpose of the institute will be to coordinate all forms of transportation.

Massachusetts Station.—Dr. Monroe E. Freeman, assistant professor of agricultural and biological chemistry in the University of Maine, has been appointed research professor of chemistry and entered upon his duties on June 1.

Missouri University and Station.—Dr. Hans Jenny, assistant professor of soils, has resigned to accept a position in soil and colloid chemistry in the University of California, beginning next September.

Nebraska Station.—Plans have been completed and a contract let for two greenhouse units, each 28 by 100 ft., with appropriate head houses.

New Mexico Station.—The resignations are noted of H. N. Watenpaugh on May 31 as associate agronomist to become soil specialist in the Federal Resettlement Administration and R. P. Callaway on June 15 as assistant agricultural economist to accept a position with the Market Agreements Section of the U. S. D. A. Agricultural Adjustment Administration.

Pennsylvania College and Station.—The Pennsylvania State College has recently purchased for $5,000 an adjoining farm containing approximately 200 acres for use in research and instruction. This enlarged area will enable the needs of the new Regional Pasture Laboratory (E. S. R., 75, p. 1) to be supplied on land owned by the college or transferred by it to the U. S. D. A. Bureau

of Plant Industry. Extensive plans are under way for building a laboratory and office building, greenhouses, and service buildings, together with an ultimate utilization of a tract of land extending to probably 40 acres.

Plans are also being made for the establishment of a display garden for the division of ornamental horticulture. A considerable area is being set aside, and will be devoted for the present primarily to annual flowering plants. The plan also includes an extensive rose garden as soon as the proper stocks can be obtained.

In cooperation with the Federal Resettlement Administration plans are under way for the development of a research forest for the station in Stone Valley, located between State College and Huntingdon. This area includes approximately 6,000 acres, on which the Resettlement Administration has obtained options. When the plans have been finally consummated the station will have near at hand a suitable and extensive laboratory for forestry work.

World's Poultry Congress.—Legislation approved by President Roosevelt on June 20 authorizes the expenditure of not to exceed $25,000 of the funds of the U. S. D. A. Agricultural Adjustment Administration for participation by the United States in the Sixth World's Poultry Congress, which is being held in Leipsig from July 24 to August 2. Of this sum, $10,000 was made immediately available for assembling a live-bird exhibit and other material showing poultry husbandry methods followed in this country. The President was also requested to extend an invitation to hold the seventh congress in the United States in 1939.

Sixth International Seed Testing Congress.—This congress, recently held in Stockholm, accepted an invitation to hold the seventh congress in Washington, D. C., in 1937.

Fourth International Grassland Congress.—This Congress, which is to be more extensive in scope than its predecessors, is to be held at Aberystwyth, Wales, from July 15 to 18, 1937, and will be both preceded and followed by excursions to other points of grassland interest in England and Scotland. The program will include sessions on the following topics: (1) Ecology (including surveys), pasture management (including erosion control); (2) seeds mixtures (including lucerne for grazing), and legumes for use in poor pastures; (3) plant breeding, genetics, and seed production; (4) manures and fertilizers; (5) fodder conservation; and (6) grassland economics.

The president of the Congress is Prof. R. G. Stapledon, director of the Welsh Plant Breeding Station and of the Imperial Bureau of Plant Genetics: Herbage Plants, and further information may be obtained from the joint secretaries at the same institution.

Fifth International Congress of Agricultural Education.—This Congress, scheduled to be held in Buenos Aires during 1936, has been postponed until 1937. Efforts are being made to coordinate through the International Institute of Agriculture at Roma and the International Labor Office at Geneva, as representatives of the various governments, the organization of international congresses in the field of agricultural education, and the dissemination of their results.

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EXPERIMENT STATION RECORD

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THE AGRICULTURAL DEPARTMENT APPROPRIATION ACT FOR 1937

According to a summary appearing in the *Congressional Record* of July 1, 1936, as an extension of the remarks of Hon. James P. Buchanan of Texas, chairman of the House Committee on Appropriations, the total appropriations authorized by the Congress at its recent session for all purposes aggregate $10,338,938,839.69. Of this amount $1,013,721,375.38, or a little less than 10 percent, is classified under the heading of "assistance to agriculture." Mainly through the annual appropriation act signed June 4, 1936, approximately 1.25 percent of the total appropriations, $129,891,202, is allocated for the regular activities of the Department of Agriculture (exclusive of roads and the AAA) for the fiscal year ending June 30, 1937.

For the previous year the comparable provisions, including those carried in the annual appropriation act, supplementary deficiency grants, and the "permanent appropriations", were $105,183,032. This apparent increase of $24,708,170 is a resultant of numerous readjustments, of which the largest items are increases of $17,919,857 for the Soil Conservation Service and the reappropriation of $11,364,000 additional for payments to owners and related purposes in connection with the campaign for the elimination of diseased cattle.

No detailed estimate is available at the time of writing as to the proportions available for research, but existing projects are for the most part continued, in some cases with increased funds, and there are a number of new undertakings. Provision was duly made for the special research fund authorized for the Department under the Bankhead-Jones Act of 1935 (E. S. R., 73, p. 289; 75, p. 1), so that for this purpose $800,000, an increase of $400,000, will be available.

The Bankhead-Jones funds for the State experiment stations will likewise be doubled, making $1,200,000 available, plus the usual $720,000 under the Hatch Act, a like amount under the Adams Act, and $2,880,000 from the Purnell Act, or a total of Federal contributions under these acts of $5,520,000. In addition there are supplementary payments for experimental work of $62,066 for work in Hawaii, $15,000 in Alaska, and $92,245 in Puerto Rico. This is an increase of $20,000 in the supplementary allotment for Puerto Rico and is to extend experimental work under way there in connection

with the contemplated gradual transformation of this station into a departmental outpost station. For the expenses of the Office of Experiment Stations itself, $161,735 (plus $16,000 from Bankhead-Jones funds) will be available for the administration of the Hatch, Adams, Purnell, and Bankhead-Jones Acts, the preparation of *Experiment Station Record*, and related purposes. This is an increase of $13,500 over the previous year.

The funds administered by the Extension Service are increased from $12,974,754 to $13,330,672. This includes an increase of $1,000,000 in the Bankhead-Jones funds, but $645,000 has been deducted from certain other supplementary funds hitherto available under a sliding-scale arrangement designed to effect their complete replacement by Bankhead-Jones funds by 1940.

A decrease from $11,339,259 to $10,063,963 is indicated for the Bureau of Animal Industry, but this is largely accounted for by the availability of emergency allotments of $1,500,000 for the payment of indemnities in the tuberculosis eradication campaign. There is a decrease of $100,000 in the tick eradication funds and an increase of $50,000 for the enforcement of the Packers and Stockyards Acts.

The Bureau of Dairy Industry receives an increase from $646,594 to $697,094. The principal items of increases are $7,000 for enlarging the dairy cattle nutrition investigations, $22,000 for the permanent recording of all cows on tests in dairy herd improvement associations, and $3,500 for additional inspections of renovated-butter factories and of all dairy products for export, while $12,000 is to continue investigations with Red Danish cattle which have been transferred from the Bureau of Animal Industry.

Comparatively few changes were made in the allotments of the Bureau of Plant Industry, its total rising from $4,518,944 to $4,551,206. Provision is made of $15,000 for a laboratory for soft wheat investigations at the Ohio Experiment Station and a like amount for the more rapid development of the national arboretum, and of smaller amounts for additional work with alfalfa, azaleas, and mushrooms.

A total of $17,738,505 is provided for the Forest Service, in addition to $8,000,000 for the construction of forest roads and trails. Among the substantial items entering into its $4,761,671 increase are $2,450,000 additional for the acquisition of lands, $2,806,373 for administration of the national forests, and $170,000 for "maintenance in nurseries of existing stocks and for the free distribution thereof to farmers, in liquidation of the so-called shelter belt project of trees or shrubs in the plains region undertaken heretofore pursuant to appropriations made for emergency purposes." The allotment for fighting forest fires, for which $1,376,709 was available for the fiscal year

1936, was set at $100,000, and the Nation-wide forest survey fund was curtailed from $250,000 to $200,000.

There are some transfers of funds and functions to and from the Bureau of Chemistry and Soils, and the net result is an increase from $1,279,434 to $1,398,272. This includes an increase of $20,000 for studies of the production of cellulose, paper, and board from farm products to be carried on at Ames, Iowa, and $5,000 to develop new domestic sources of tannin, $10,000 for an extension of the studies of spontaneous heating of alfalfa and other hays and agricultural products, and $10,000 for the coordination of soil tests as to the need for fertilizers and other soil amendments. The allotment for the soil surveys was continued at $286,208, but $15,000 additional was granted for increased map-drafting work in the preparation of soil maps for publication.

An apparent decrease from $7,837,421 to $5,317,675 for the Bureau of Entomology and Plant Quarantine is accounted for mainly by the elimination of $2,500,000 for chinch bug control, $24,856 for date scale control, and $36,000 for the West Indian fruitfly and blackfly campaign. Most of the projects are continued unchanged, but there are increases of $50,000 for Japanese beetle control, $25,000 for the grasshopper surveys, $10,000 for screwworm studies and control, and $5,000 for studies of the corn earworm in relation to tomatoes.

There is an increase from $1,446,492 to $1,961,224 for the Bureau of Biological Survey, the largest additions being $77,022 for the protection of migratory birds, $237,486 for the maintenance of mammal and bird reservations, and $125,000 for establishing a migratory bird conservation fund in anticipation of stamp tax receipts. An increase of $20,000 for biological investigations is provided for the extension of the game management surveys.

The allotments for the Bureau of Agricultural Economics show a total of $5,992,896 and a net increase of $258,095, of which $182,895 is for the enforcement of the Tobacco Inspection Act of 1935 and $10,000 for additional service under the Perishable Agricultural Commodities Act. Provision is also made for increased work on poultry and egg reports, the U. S. Grain Standards Act, the U. S. Warehouse Act, farm indebtedness, and farm population and rural life studies.

Increases from $193,485 to $219,085 are authorized for the Bureau of Home Economics. These will permit of the employment of an assistant chief and provide $20,000 for studies of human requirements for trace minerals and vitamins and of electrical and other kinds of household equipment.

The Soil Conservation Service, hitherto financed mainly from emergency funds, is given $475,000 for administration, $1,540,780

for soil and moisture conservation and land use investigations, and $22,853,485 for soil and moisture conservation operations, demonstrations, and information. The research program contemplates the operation of at least 22 experiment stations at a cost of $723,170, as well as 141 demonstration projects and 445 CCC camps engaged in soil conservation activities.

The remaining work of the Department is provided for much as at present. The Weather Bureau receives increases aggregating $421,820, of which $280,160 is for additional aerological work, making its total $3,861,024; the Bureau of Agricultural Engineering, $438,269, an increase of $15,000 for investigations for cotton-producing and ginning machinery; and the Office of Information, $1,217,532, an increase of $54,250, of which $12,000 is for the Yearbook, $13,500 for Farmers' Bulletins, $2,105 for separates of the *Journal of Agricultural Research*, $2,000 for circulars, and $3,700 for statistical bulletins and the Agricultural Situation. An increase of $109,121 for the Food and Drug Administration brings its total to $2,077,758. There is again allotted $196,500 for the enforcement of the Grain Futures Act and $75,000 for administrative purposes at the Beltsville Research Center. The Library receives $103,800, an increase of $2,988.

The foregoing discussion does not include either the Bureau of Public Roads or the Agricultural Adjustment Administration, nor has it seemed feasible to bring into the picture all of the various supplementary funds which have been or may be available. The aim has been merely to attempt a comparison of the general outlook for those agencies specifically financed by the agricultural appropriation act with their status in the previous year.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Researches in biological chemistry by the New Haven Station] (*Connecticut [New Haven] Sta. Bul. 381 (1936), pp. 171–174*).—These investigations have included a study on glutamine in tomato plants (E. S. R., 74, p. 437) and the relation of the basic amino acids in human skin to keratin.

A note on azoproteins, W. C. BOYD and P. MOYER (*Jour. Biol. Chem., 110 (1935), No. 2, pp. 457–459*).—Determinations of the nitrogen and arsenic content of proteins which had been coupled under various conditions with diazotized arsanilic acid indicated that the arsenic: nitrogen ratio can be made much higher than would be accounted for by the assumption that diazotized amines couple with proteins only through the tyrosyl and histidyl groups.

Investigating the possibility that coupling might occur with diketopiperazine rings in the proteins, the authors found that no coupling occurred with diketopiperazine itself, and coupling to proteins in the presence of alcohol and ammonia decreased the ratio instead of increasing it. The possibility that "the strong alkali used in the coupling might selectively split off from the protein certain noncyclic amino acids or polypeptides, leaving a higher proportion than originally of cyclic to noncyclic amino acid groups, leading to a higher As: N ratio," was also experimentally eliminated. "Thus no explanation which has thus far suggested itself to us can account for the fact that repeated coupling will in some cases raise the As: N ratio to more than twice what it could be, assuming that the diazotized arsanilic acid couples only with the histidine and tyrosine in proteins, even when the highest reported analytical figures for these amino acids are used in the calculation."

The synthesis of homocystine, W. I. PATTERSON and V. DU VIGNEAUD (*Jour. Biol. Chem., 111 (1935), No. 2, pp. 393–398*).—The authors note that "the use of methionine as the starting material for the preparation of homocystine has made homocystine a rather expensive compound", and, further, that "a practical synthesis of S-benzylhomocysteine would have the advantage of making available a single key substance from which could be prepared, in addition to homocystine, methionine, S-ethylhomocysteine, homocysteine, the lactone of homocysteine, and various other derivatives."

They prepared benzyl-β-chloroethyl sulfide from the sodium salt of benzyl mercaptan and ethylene dichloride (yield, 71 to 75 percent of the theoretical). Benzyl-β-chloroethyl sulfide, a strong vesicant, yielded about 75 percent of the theoretical quantity of benzylthiolethylmalonic acid, on treatment in the manner described, with the sodium compound of diethylmalonate. Benzylthiolethylmalonic acid was brominated and the bromine derivative treated with ammonia without isolation of the bromine derivative, 127 g of benzylthiolethylmalonic acid yielding from 60 to 70 g of S-benzylhomocysteine. Treatment of the last-named compound with sodium gave homocysteine in a 75-percent yield from the liquid ammonia method and in a 78-percent yield from the hot butyl alcohol procedure.

Unrecognized forms of sulfur in proteins, D. BLUMENTHAL and H. T. CLARKE (*Jour. Biol. Chem., 110 (1935), No. 2, pp. 343–349*).—The authors find that proteins appear to contain, besides cystine and methionine, at least two other sulfur-bearing constituents. One of these yields sulfate on treatment with bromine water and sulfide with alkaline plumbite; the other yields sulfate on boiling with nitric acid, but fails to respond to plumbite. The authors detail their methods for the determination of the sulfur contained in these types. The data recorded include the percentage of the total sulfur content of the following compounds which was converted into lead sulfide by treatment in accordance with the methods described with an alkaline plumbite and into sulfate by treatment with bromine water: Cystine (reduced), glutathione, thioglycolic acid, benzyl mercaptan, thiobenzophenone, thioacetamide, thioacetanilide, thiourea, thiocarbanilide, ammonium thiocyanate, ergothioneine, rhodanine, potassium ethylxanthate, and carbon disulfide.

Interaction of amino acids and salts.—I, II, N. R. JOSEPH (*Jour. Biol. Chem., 111 (1935), No. 2, pp. 479–487, fig. 1; 489–499, figs. 2*).—The two papers noted form a contribution from the Harvard Medical School.

I. *Zinc chloride.*—The effect of amino acids on the activity coefficient of zinc chloride was determined by means of cells without liquid junction; and the results were used in a calculation of the activity coefficients of glycine and valine in the presence of zinc chloride. A comparison with corresponding effects in mixtures of glycine and alkaline earth salts, determined by freezing points, was also made. The results are compared, in terms of the interionic force theory, with those of solubility studies in media of low dielectric constant. The results in aqueous systems are described on the basis of attractive forces between ions and zwitter ions and of nonelectrostatic "salting-out" forces of opposite sign.

II. *Sodium chloride and thallous chloride.*—The effect of amino acids on the activity of coefficients of thallous chloride and sodium chloride was determined as in the work above noted.

Limitations of the method applied to sodium chloride are discussed; and "the results are interpreted as indicating not only electrostatic attraction between ions and zwitter ions, but also repulsive forces which are relatively greater the greater the hydrocarbon chain of the amino acid and the dielectric constant of the solvent."

The formation of fatty acids from glucose by Aspergillus niger, C. F SCHMIDT, JR. (*Jour. Biol. Chem., 110 (1935), No. 2, pp. 511–520*).—The fully developed mycelium of a strain of *A. niger* placed upon fresh glucose solution has been shown to synthesize fatty acids under conditions in which further growth cannot take place. "The fatty acid content of the mycelium is increased approximately 100 percent in the course of 3 days. The increase in fatty acids is apparently independent of the initial H-ion concentration between pH 2.4 and 8.2. No relationship between H-ion concentration and degree of unsaturation of the fatty acids could be found.

"The presence of iodoacetic acid in 0.001 M concentration had no effect upon the synthesis of fatty acids from glucose by *A. niger*. Fatty acid formation was found to take place under anaerobic conditions but to a lesser degree than under aerobic conditions. Glucose disappears under anaerobic conditions, but no metabolic products have been found."

Hemicellulose from oat hulls, E. ANDERSON and P. W. KRZNARICH (*Jour. Biol. Chem., 111 (1935), No. 2, pp. 549–552*).—In a joint contribution from the Carnegie Institution of Washington, Stanford University, and the University of Arizona, it is reported that an extraction of oat hulls with a 5-percent

solution of sodium hydroxide gave a mixture of hemicelluloses, and that, after hydrolysis of the hemicellulose, the sugars *d*-xylose and *l*-arabinose and a compound of *d*-glucuronic acid with 2 molecules of *d*-galactose were found to be present.

Some effects of dinitrocresol on oxidation and fermentation, M. E. KRAHL and G. H. A. CLOWES (*Jour. Biol. Chem., 111 (1935), No. 2, pp. 355–369, fig. 1*).—The authors report a variety of experimental results which "afford substantial evidence that the principal effect of 4,6-dinitro-*o*-cresol on oxidation precedes and is not directly concerned with oxygen activation and transfer." The observations recorded also "appear to indicate that 4.6-dinitro-*o*-cresol can markedly affect those anaerobic processes which are concerned with supply and activation of the substances destined to be oxidized or fermented by the cell."

Concerning enzymic reactions in heavy water, D. L. FOX (*Jour. Cell. and Compar. Physiol., 6 (1935), No. 3, pp. 405–422, figs. 5*).—This contribution from the University of California records experiments with the catalase and amylase obtained from the California mussel, and with emulsin.

"There was no evidence that any of the enzymes studied were inactivated to any degree by heavy water, even when both enzymes and substrates were previously incubated separately with the isotope for many hours. Indeed, the rate of hydrolysis of starch by amylase was apparently slightly enhanced in some of the experiments wherein concentrated heavy water [99 percent D_2O] was used."

Concerning enzymic reactions in heavy water.—II, Deuterium and the hydrolysis of starch, D. L. FOX and R. CRAIG (*Soc. Expt. Biol. and Med. Proc., 33 (1935), No. 2, pp. 266–269, fig. 1*).—In further amylase experiments in this series, "from the few experiments permitted by the limited supply of heavy water on hand it is provisionally concluded that starch which has been allowed to become hydrated with heavy water, or which may have exchanged some of its labile protium for deuterium, is more readily hydrolyzed by this enzyme, other conditions being the same, than is starch of ordinary history."

The absorption of carbon monoxide with reduced hematin and pyridine hemochromogen, L. E. CLIFCORN, V. M. MELOCHE, and C. A. ELVEHJEM (*Jour. Biol. Chem., 111 (1935), No. 2, pp. 399–409, figs. 3*).—The relative rates of absorption of carbon monoxide at 25° C. by acid- and alkaline-reduced hematin and pyridine hemochromogen have been determined at the University of Wisconsin. It was shown that an excess of pyridine expels carbon monoxide from carbon monoxide pyridine hemochromogen. The dissociation constant for carbon monoxide pyridine hemochromogen to carbon monoxide and monopyridine hemochromogen in a solution containing no excess of pyridine was found to be 1.24×10^{-4}.

A variable layer photoelectric comparison photometer.—A new type of photoelectric colorimeter, A. GOUDSMIT, JR., and W. H. SUMMERSON (*Jour. Biol. Chem., 111 (1935), No. 2, pp. 421–433, figs. 3*).—The instrument described in this contribution from Cornell University "is essentially a variable layer comparison photometer in which photoelectric cells are used to indicate equivalence of light transmission. . . .

"The use of two photoelectric cells arranged to oppose each other and receiving light from a single source, passing essentially identical optical trains, avoids the errors of instability due to changes in the intensity of the light source. The high degree of stability thus obtained permits the use of a sensitive galvanometer as an indicating instrument. Operation and calculations are similar to those of conventional colorimetric procedures. Thus the instrument embodies all the advantages of the usual cup and plunger type of colorim-

eter together with the precision attainable through a sensitive and objective method of photometry by physical means."

Zinc pellets for the generation of arsine in the Gutzeit method, P. A. MILLS (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 3, pp. 506, 507, fig. 1*).—The author of this note from the U. S. D. A. Food and Drug Administration cast zinc pellets in a bullet mold drilled out to form 9 by 12.5 mm. Pellets thus made were more uniform in size and shape than could be had by breaking or sawing the pure stick zinc as bought. The zinc had to be melted in porcelain vessels, however, as when the zinc was melted in an iron ladle "perfect pellets were obtained but iron contamination increased the activity enormously."

Preparation of standard solutions of potassium bromate, M. L. YAKOWITZ (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 3, pp. 505, 506*).—A note from the U. S. D. A. Food and Drug Administration reports that potassium bromate, three times recrystallized from hot water and dried at 140° C., could be used for the preparation of standard solutions by direct weighing. The salt thus purified, when kept in a glass-stoppered amber bottle, was still suitable for the preparation of accurate standards after 16 mo. The solutions made up in this way were found to be accurate to 0.05 percent.

Micromethods for determination of ammonia, urea, total nitrogen, uric acid, creatinine (and creatine), and allantoin, H. BORSOOK (*Jour. Biol. Chem., 110 (1935), No. 2, pp. 481–493*).—The author describes in detail improvements in the micromethods for the determination of ammonia, uric acid, creatinine, and allantoin.

"These improvements lead to a greater stability of the final color, increased sensitivity, and specificity, and, by use of a suitable approximately monochromatic light in the colorimetry, a great extension of the region of linear relationship between intensity of color and concentration."

The modified methods made it possible to carry out a large number of determinations (20–40) at the same time, with the use of only a few standards.

Complex salts of amino acids and peptides.—II, Determination of l-proline with the aid of rhodanilic acid. The structure of gelatin, M. BERGMANN (*Jour. Biol. Chem., 110 (1935), No. 2, pp. 471–479*).—The second of this series of contributions (E. S. R., 74, p. 438) reports that "it has been possible to change the behavior of the Reineckate complex towards amino acids by introducing into the complex amines other than ammonia. With two aniline groups an excellent means for the determination of proline was obtained. This new complex acid is tetrathiocyanato-dianilidochromiato acid, $[Cr(CNS)_4(C_6H{\cdot}NH_2)_2]H$. It is referred to . . . as 'rhodanilic acid' and its salts are called 'rhodanilates.'

"Rhodanilic acid is formed from chromic sulfate or chrome alum, potassium thiocyanate, and aniline. . . . The following reactions take place: $[CR_2(SO_4)_3] + 12KCNS = 2[Cr(CNS)_6]K_3 + 3K_2SO_4$ $[Cr(CNS)_6]K_3 + 4C_6H_5{\cdot}NH_2 + CH_3COOH = 2KCNS + CH_3COOK + [Cr(CNS)_4(C_6H_5NH_2)_2]$ $(C_6H_5{\cdot}NH_2){\cdot}(C_6H_5NH_2)$. An aniline rhodanilate containing an extra molecule of aniline is obtained. This salt may easily be converted into the ammonium salt with ammonium hydroxide. Rhodanilic acid forms rose-colored, well crystallized salts with basic nitrogen compounds, and in particular with alkaloids and with amino acids."

"Of the rhodanilates of amino acids, that of proline distinguishes itself by slight solubility and rapid crystallization. With the aid of the rhodanilate method a determination of proline in gelatin was performed. From a hydrochloric acid hydrolyzate of gelatin, arginine was first removed by flavianic acid. Then ammonium rhodanilate was added to the mother liquor as long as a uni-

form precipitation of the proline salt took place. The quantity necessary was determined by examining the precipitate under the microscope in the course of successive additions. The proline rhodanilate was analyzed and converted into free *l*-proline.

"In order to obtain the free amino acid from the proline rhodanilate, advantage was taken of the fact that pyridine rhodanilate is very difficultly soluble in water. It is therefore sufficient to suspend the solid proline rhodanilate in water and to add a little pyridine in order to precipitate almost instantaneously the entire rhodanilic acid as pyridine salt; on filtration a faintly colored aqueous solution of *l*-proline is obtained. Pure *l*-proline of $[\alpha]_D = -85.6°$ [C.] crystallizes out on evaporation. These preparations contain no *dl*-proline or hydroxyproline."

The determination of thyroxine in thyroid substance, N. F. BLAU (*Jour. Biol. Chem., 110 (1935), No. 2, pp. 351–363, fig. 1*).—In the investigation here reported from Cornell University "it has been shown that for the extraction of thyroxine with butyl alcohol from an acidified solution of thyroid material, hydrolysis with alkali need not be as complete as for similar extraction at an alkaline reaction." Barium hydroxide in an 8-percent solution was found to be a more effective agent for the hydrolysis of the thyroid substance in connection with thyroxine determination than was either an equivalent concentration of sodium hydroxide or a 2 N NaOH solution. On the basis of the finding that it is possible to extract thyroxine quantitatively from an 8-percent solution of barium hydroxide by means of butyl alcohol, a method was developed for the determination of thyroxine in thyroid powder and in fresh gland substance. "The advantage of the method is a shorter time required to yield results which are probably not over 10 percent lower than the actual thyroxine content of the material analyzed.

"Approximately 30 percent of the total iodine in commercial thyroid powder and desiccated and fresh pig thyroids (summer glands) was found to be in the form of thyroxine."

A method for the direct and quantitative study of amyloclastic activity of amylases, M. L. CALDWELL and F. C. HILDEBRAND (*Jour. Biol. Chem., 111 (1935), No. 2, pp. 411–420, figs. 2*).—This method for the measurement of amylase activity depends upon the determination of residual starch or amylose, at any stage of its hydrolysis by amylases, through its quantitative precipitation by ethyl alcohol. The precipitates obtained under the specified conditions were found not to be appreciably contaminated by dextrins or maltose.

"The method appears to offer a more direct measure of the early stages of the amyloclastic activity of amylases than is afforded by other methods previously available. It is practicable, accurate, and adapted for use with different amylases."

A modified technic for the determination of citrate-insoluble P_2O_5, W. H. MACINTIRE and L. J. HARDIN (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 2, pp. 297–301*).—An attempt was made at the Tennessee Experiment Station "to obtain a true solution of neutral phosphatic materials with filtration by suction in the determination of citrate-insoluble P_2O_5." It is reported that "the results show that the inclusion of electrolytes in the hot washings will result in clear filtrates of some natural phosphates"; and although the data obtained are not sufficient to demonstrate the preferred electrolyte nor the most effective concentration, the authors believe that "they do indicate that a procedure could be perfected to insure that the filtrate and washings would not carry finely divided material through the filter to register a solubility greater than the actual value."

Comparison of filtration by gravity and by suction in washing to remove water-soluble P_2O_5 from analytical charges, W. H. MACINTIRE, R. M. JONES, and L. J. HARDIN (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 2, pp. 301–306*).—In a further discussion of the subject of the paper above noted, the authors state that the "data indicate that the use of successive decantations and washings of the 1-g analytical charges, previously mixed with paper pulp, would be permissible to expedite the recovery of water-soluble P_2O_5. The distinct expediting of the filtration of a single analysis, or a small number of analyses, is of especial advantage. The time required for duplicate washings is reduced to a maximal period of 20 min., whereas as much as 5 hr. is frequently required for some samples filtered by gravity. It is of course not necessary to use the multi-unit battery of filters such as that used in filtration by gravity, since two suction units will keep the analyst engaged continuously during the washing operation."

Notes on estimating available phosphorus by extracting soils with a potassium carbonate solution, R. S. WHITNEY and R. GARDNER (*Soil Sci., 41 (1936), No. 1, pp. 33, 34*).—A procedure contributed from the Colorado Experiment Station is to be carried out as follows: Weigh out a 2-g sample of soil, which has been passed through a 1-mm sieve, and place in a 250-cc flask. Add 150 cc of a 1-percent solution of phosphorus-free potassium carbonate and place on a previously heated hot plate. The temperature should be regulated so that the solution simmers for about 45 min. In 60 min. remove the flask and allow it to cool. After settling for 12 to 24 hr., transfer 10 cc of the supernatant liquid to a 100-cc Erlenmeyer flask. Add 1 cc of bromine water. Heat to boiling and add 0.4 cc of 5 N HCl and 0.5 cc of 10-percent sodium sulfite. The extract should be clear at this point. Remove and cool. Neutralize (1 drop in excess) with 0.5 NaOH, using 1 drop of 0.25-percent alcoholic phenolphthalein as the indicator. If the end point is overrun, titrate back with 0.5 N sulfuric acid. Make up to 15 cc with distilled water and shake. To the slightly pink solution, add 1 cc of the molybdic oxide reagent from a burette. Shake, add exactly 0.2 cc of stannous chloride reagent, and mix well. After 5–10 min., place 10 cc of the solution in a square test tube and compare the color with the standard phosphate solution, using any good color comparator.

To prepare the molybdic oxide reagent, add 6.02 g C. P. anhydrous MoO_3 to 120 cc of concentrated H_2SO_4 (sp. gr. 1.84:94 percent). Heat with stirring until dissolved. Cool and make up to 800 cc with distilled water. To prepare the stannous chloride stock solution, dissolve 25.5 g $SnCl_2 \cdot 2H_2O$ in 125 cc of HCl (sp. gr. 1.18:35–7 percent) and make up to exactly 1 l. Keep under white mineral oil in a dark bottle. To prepare the work solution, quantitatively dilute 20 cc of the stock solution to 250 cc (dilute 1:5) with pure distilled water. This solution must be renewed every 2 or 3 days, or when it turns yellow.

Comparative study of the Official and a modified method for determining available potash in mixed fertilizers, H. R. KRAYBILL and S. F. THORNTON (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 2, pp. 260–281, fig. 1*).—A detailed investigation of the degree of accuracy obtainable in the use of the present Official method and of the sources of error in its procedure has been carried out at the Indiana Experiment Station.

It was found that failure to recover the added potash in mixed fertilizers completely by the Official method is due chiefly to the incomplete removal of potash from the residue in the preparation of the solution, to loss during ignition through spattering and formation of difficultly soluble meta silicates of potassium, and to occlusion or adsorption by the precipitate formed from

the addition of ammonium hydroxide and ammonium oxalate; and that minor losses may occur through the solvent action of the 80 percent alcohol used in washing the potassium chloroplatinate precipitate.

It is shown that loss during ignition may be prevented by using a specially designed burner top, which permits gradual heating of the dish at low temperatures on the sides as well as on the bottom. Failure to secure complete extraction and losses by occlusion were shown to be overcome by the use of a modified method in which the solution is prepared by boiling the sample in a 250-cc volumetric flask with 50 cc of saturated ammonium oxalate solution and 150 cc of water for 30 min. A slight excess of ammonium hydroxide is then added, and after cooling the solution is made to the mark and filtered. Sufficient potash-free normal sodium hydroxide is added to the aliquot of the solution to prevent the formation of free phosphoric acid during ignition, and the procedure is continued according to the present Official method.

A comparison of the Official and the modified methods on 51 samples of fertilizer submitted by manufacturers from all parts of the country and on 33 Official samples obtained in the inspection work in Indiana in 1933 indicated that the modified method yields higher results in most cases. The average of the increases for the 84 samples was 0.24 percent. The increases ranged from less than 0.10 to over 0.80 percent.

"The results indicate that the losses by the Official method are greater when the potash in the fertilizer is derived from sulfate rather than muriate of potash and when the superphosphate is derived from Tennessee rather than Florida rock. The losses appear to be less when ammoniated superphosphate is used than when superphosphate is used. Addition of lime did not appear to have any definite effect on the loss of potash. . . .

"The modified method does not give significantly higher results than the Official method with potash minerals (ground to pass a 1.0 mm sieve), such as muscovite, orthoclase, green sand, and Cartersville shale. Analyses by the Official method of various laboratory mixtures of fertilizers containing superphosphate, muriate of potash, sulfate of potash, hydrated lime, sodium sulfate, and ferric chloride are frequently significantly lower than the theoretical amount. Analyses of such mixtures by the modified method agree very closely with the theoretical amounts of potash. There is a source of error due to the nonuniformity of the 2.5-g samples weighed out which needs further study.

"There is a close correlation between the increases obtained by the modified method over the Official method and the availability of the potash in the residues of samples of fertilizers as determined by the Neubauer method (E. S. R., 53, p. 319) and pot tests. The increased amount of potash obtained by the modified method is available to plants."

Loss of available potash in the extraction of mixed fertilizers by the Official method, W. H. Ross, K. C. Beeson, L. M. White, and A. R. Merz (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 2, pp. 327–332*).—The authors report from the U. S. D. A. Bureau of Chemistry and Soils an investigation of which the results indicate that because of occlusion or adsorption of a small portion of the potassium in the basic iron and aluminum phosphates formed in the extraction of the sample, the Official method for determining available potash in fertilizer mixtures containing superphosphate fails to recover all the water-soluble potassium included in the mixture.

"The loss of potash varies with the iron and aluminum content of the phosphatic materials used in the manufacture of the superphosphate. Within limits, the loss of potash increases with the age of the mixture and is greater

when the potash is mixed with a cured superphosphate than when it is mixed with a fresh superphosphate. The loss of potash, in percentage of the total potash in the mixture, increases as the proportion of K_2O to P_2O_5 in the mixture decreases. The loss of potash is greater in mixtures of superphosphate with potassium sulfate than in the corresponding mixtures with potassium chloride. The method of solution proposed by Kraybill and Thornton [noted above], in which the sample is digested in boiling ammonium oxalate solution, insures a more complete extraction of the potash by dissolving the iron and aluminum phosphates in the sample and preventing their reprecipitation in a more basic form in contact with the potash present."

Available potash content of fertilizer residues extracted according to the Official method, S. F. THORNTON and H. R. KRAYBILL (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 2, pp. 281–293, figs. 3*).—As a result of an investigation reported from the Indiana Experiment Station, in the course of which residues extracted according to the Official method from a large number of mixed fertilizers were examined for their available potash content by means of extraction with dilute salt solutions, the Neubauer method (E. S. R., 53, p. 319), and pot tests, it is shown by all these methods that extraction according to the Official method often leaves in the extracted residue a portion of the available potash. In some fertilizers this was small, but in others it was quite large. The average for all samples examined was approximately 0.25 percent. "Residues from fertilizers containing sulfate of potash gave consistently high values, but no consistent relationship was found for the use of lime or other alkaline materials or for the pH of the water-fertilizer suspension. Doubling the prescribed amount of water and boiling with water failed to give complete extraction of potash. Boiling with dilute salt solutions gave a residue practically free from available potash."

Use of Aspergillus niger in testing potash availability, L. D. HAIGH (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 2, pp. 293–297*).—According to the results of some experiments reported from the Missouri Experiment Station, "it is evident that more work must be done on the details of procedure to be followed in controlling the acidity and conducting the test. However, the preliminary results reported show some differences for the different forms of potash and therefore indicate that some modified form of the method may be useful in distinguishing between insoluble forms of potash of different availability."

A study of the practicability of the Walkley and Black method for determining soil organic matter, G. O. BAKER (*Soil. Sci., 41 (1936), No. 1, pp. 47–51, fig. 1*).—A comparison of the Walkley and Black (E. S. R., 70, p. 742) approximate method with the wet combustion method for the determination of organic carbon in 7 widely different soils to portions of which were added 1 and 2 percent of straw, respectively, is reported in a contribution from the Washington Experiment Station. The organic matter in 4 of these soils was fractionated by extraction with 80 percent sulfuric acid, and the organic carbon in the two fractions was determined separately by both methods. The effect of carbonates on the new method was also tested.

"The results obtained by the approximate method are slightly higher than those obtained by the wet combustion method but in general they are parallel. The approximate method accounts for practically all of the organic matter that was added in the form of straw. When the organic matter was divided into the easily and difficultly decomposed fractions the results of both methods agreed very well for the former, but the same general differences observed for the results on the unfractionated soil were found in those for the difficultly decomposed portion of the organic matter. Probably the more resistant forms

of organic matter and possibly certain oxidizing or reducing substances present in the soil are responsible for the higher results obtained by the approximate method. The Walkley and Black method is adapted for determining the approximate amount of organic matter in soils containing inorganic carbonates without correcting for their presence."

Estimation of iodine in soils, G. S. FRAPS, J. F. FUDGE, and E. C. CARLYLE (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 2, pp. 314, 315*).—The authors report from the Texas Experiment Station that "the procedure used at present at this station for the determination of iodine in soils gives fairly satisfactory results in the hands of an experienced analyst, but it is not entirely satisfactory." Both direct and indirect methods are described, and various necessary modifications of previous procedures are indicated.

Improvements in the methods for calcium determination in biological material, C. C. WANG (*Jour. Biol. Chem., 111 (1935), No. 2, pp. 443–453*).—The author shows that a new washing solution for the calcium oxalate precipitate, consisting of 2 percent ammonia in equal parts of alcohol, ether, and water, prevents flotation and permits washing of the precipitate without appreciable loss of calcium. He also finds that the treatment of urine with trichloroacetic acid and carbon allows a direct determination of calcium in urine.

A note on a closed titration flask for use in the bromometric determination of magnesium with 8-hydroxyquinoline.—Application to the estimation of magnesium in tissues and urine, D. M. GREENBERG, C. ANDERSON, and E. V. TUFTS (*Jour. Biol. Chem., 111 (1935), No. 2, pp. 561–565, fig. 1*).—The authors of a contribution from the University of California describe an apparatus which "consists of a 250-ml capacity suction flask . . . which is stoppered with a long-stemmed glass funnel (6-in. stem). The funnel is fitted into a thoroughly paraffined cork stopper. In the side arm of the suction flask . . . there is introduced a bit of glass wool soaked in 20-percent potassium iodide solution to trap the bromine from the air which is displaced when liquids are introduced into the flask through the funnel." The modified procedure in which this device can be used is fully detailed.

Determination of sulfur in organic compounds by the semimicro Carius method, E. P. CLARK (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 3, pp. 476, 477, fig. 1*).—A method elaborated at the U. S. D. A. Bureau of Entomology and Plant Quarantine provides a means for carrying out sulfur determinations of the Carius type on a scale small enough to require samples of only 25 mg. Modifications of the regular Carius method are only such as are required by the much smaller scale of the operations. A test determination of the sulfur content of trional gave 26.4, 26.6, and 26.5 percent as against the calculated figure, 26.5 percent.

Determination of lead, particularly in canned foods, H. J. WICHMANN and P. A. CLIFFORD (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 2, pp. 315–327*).—Methods based, in part, on destruction of organic matter either by digestion or by ashing, volatilization of tin as tetrabromide, and extraction of the lead as its diphenylthiocarbazone compound followed by electrolytic determination, are very fully described in a contribution from the U. S. D. A. Food and Drug Administration.

"The results obtained on the many products analyzed justify the conclusion that the methods described are satisfactory for the determination of lead in any canned food. The quantities of lead added were equivalent to 1–10 p. p. m. Very few canned foods exceed the upper limit; most of them are at or below the lower figure, which from a regulatory standpoint is no longer of interest. The range studied, therefore, is a fair average and well suited to the method.

The maximum percentage error recorded was 11 percent, and in most of the analyses the error was less than 5 percent, which is considered very good because, as stated previously, the total error is really the algebraic sum of two errors.

"The procedure followed for the elimination of the tin interference appears to be wholly satisfactory. The entire method has been used in the laboratories of the Food and Drug Administration and has given general satisfaction for canned foods and for many other foods."

Cereal laboratory methods, compiled by C. E. MANGELS ET AL. (*Omaha, Nebr.: Amer. Assoc. Cereal Chem., 1935, 3. ed., rev., pp. VIII+204, figs. 9*).—The first three chapters deal with the sampling of wheat and other whole grains, feeds and feeding stuffs, and wheat flour and related products; with the preparation, when necessary, of the sample for analysis; and with the various determinations mainly required in the examination of these substances. The remaining chapters take up enzymatic, physicochemical, and miscellaneous methods; baking tests; baked cereal products; macaroni products; fats and shortening materials; leavening agents; and yeast foods, flour improvers, etc. The tables needed in the calculation of the analytical results are added as an appendix.

Improved method for the determination of nitrates in meats and meat products, W. C. MCVEY (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 3, pp. 459–464, fig. 1*).—At the U. S. D. A. Bureau of Animal Industry a method based on the reaction between nitric acid and *m*-xylenol in sulfuric acid solution has been successfully adapted to the determination of nitrate nitrogen in meat, meat food products, and pickling solutions used in meat curing. The method is described as simple, rapid, easy of manipulation, and it requires no special or complicated apparatus. It is shown to be more rapid, more sensitive, and more easily manipulated than the familiar ferrous chloride method.

"As applied to meat, the method is sensitive to 0.00025 mg of nitrate nitrogen. With a 10-g sample it is possible to determine 100 or more parts per million of nitrate nitrogen with a probable error of not more than 2 p. p. m. As little as 5 p. p. m. of nitrate nitrogen may be estimated with a probable error of not more than 0.5 p. p. m." Proteins and related substances were found to interfere but were readily removed by precipitation with phosphotungstic acid. Chlorides, which also interfere, were removed by means of an ammoniacal solution of nitrate-free silver sulfate. Nitrites were converted to nitrates by a cautious oxidation with a weak solution of potassium permanganate. A satisfactory nitration of the xylenol was obtained in a solution containing from 55 to 60 percent of sulfuric acid, in which the nitration completed itself in 30 min. when the temperature was kept between 30° and 40° C.

Unified method for the determination of fat in foods with special reference to the evaluation of their butterfat content, F. HILLIG (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 3, pp. 454–459*).—A procedure for the determination of fat in foods is described in a contribution from the U. S. D. A. Food and Drug Administration. After an acid hydrolysis, previous to which paraffin is introduced as a collecting agent for fats liquid at room temperature, the fat is collected in filter cel and extracted from the dried material by a single solvent, petroleum ether.

"Because all the operations are uniform, regardless of the nature of the product, the procedure is designated 'A Unified Method.' It yields fat suitable for the determination of the R[eichert]-M[eissl] number."

Oil content as a criterion of olive maturity, G. PITMAN (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 3, pp. 441–454*).—The author of this contribution from

the University of California notes that the usual practical tests depend to a great degree on personal judgment, and that there is need for an impersonal method of estimating olive maturity.

"Oil content was found to be the most dependable measure of maturity, although this factor varies greatly with variety of fruit and locality. However, moisture content of the fresh olives closely paralleled oil content determined on the wet basis. Color was found to be a better indication of oil content than size. The oil content of olives of similar color but of different size from a given lot varied but little. However, 'orchard run' samples containing olives of all degrees of maturity and ranging in size from the smallest to the largest commercial sizes varied more or less in oil content in accordance with size because the smaller fruit was greener than the other."

Olives from northern California had a slightly higher average oil content than did those from south-central and southern California. Ripe olives from Mission olive trees grown on several different kinds of soil in the Lindsay district were found to vary in oil content only slightly, although those from trees grown in the heavy soils appeared to be somewhat higher in oil content than those from trees grown in light sandy soils. As the season advanced the oil content of olives of a given color increased, but this increase was found to be less than packers believed it to be.

"It appears from analyses of olives made before and after pickling and canning that the oil content decreases markedly either during pickling or during sterilization. In establishing minimum standards this loss should be considered."

A note on the determination of starch, O. S. RASK (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 3, pp. 502–504*).—As an improvement in the technic of a method earlier proposed by him (E. S. R., 57, p. 204), the author eliminates the difficulty sometimes experienced in attempting to disintegrate the sample after the ether, alcohol, and water washing by means of a new apparatus which "consists of a 25×200 mm Pyrex test tube, preferably heavy walled and a monel metal plunger piston or pestle. This pestle resembles somewhat a two-thirds sphere, into the center of the flat or nearly flat side of which is screwed at right angles a monel metal handle rod about 225–250 mm long and 5–6 mm in diameter. The diameter of the sphere must be 0.2–0.3 mm smaller than that of the bore of the test tube so that the sphere will function almost as a piston inside the test tube. This sphere or piston can conveniently be turned from a monel metal rod of a diameter within 0.2 mm of the bore of the test tube in which it is to be used. The outer or bottom end should be turned to a contour which will articulate closely with the bottom of the test tube, whereas the inner or top end into which the handle rod is to be screwed should be only slightly convex or nearly flat. These two end curvatures should preferably not meet on the side of the piston but should be about 4 or 5 mm apart, so that the central portion of the piston will be a cylinder 4 to 5 mm long and of the specified diameter with respect to the bore of the test tube.

"In order to obtain a close articulation between the bottom of the test tube and the plunger it is advisable sometimes to soften by heat the bottom of the test tube and then in its hot and softened condition to reshape it by means of the plunger, used then as a molding or shaping tool. . . .

"The success of this procedure depends on the clearance of about 0.2 mm or less, between the plunger piston and the wall of the test tube and the forcing of essentially all of the sample through this clearance. No material can get past the piston until it has been disintegrated to the dimensions specified, which are small enough to effect a complete dispersion of the contained [illegible] by the acid."

The correct manipulation of this device is carefully described.

Determination of methyl alcohol in alcoholic products, J. B. WILSON (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 3, pp. 477–488, fig. 1*).—The author of this contribution from the U. S. D. A. Food and Drug Administration reports upon the working out of a method for the determination of methyl alcohol in the presence of large proportions of ethyl alcohol. His procedure depends upon the formation of the iodides, their partial separation by fractionation, their conversion into salts by trimethylamine, and finally the separation of the tetramethylammonium iodide formed from the methyl alcohol by precipitation from absolute alcohol.

A somewhat elaborate apparatus is used (the method requires distillation through a reflux of closely controlled temperature), but the operation itself is easily carried out.

Methods of wine analysis.—I, Comparison of direct and indirect methods of determining alcohol, extract, and total acid in dry wine, M. A. JOSLYN and G. L. MARSH (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 2, pp. 307–315, figs. 2*).—The authors of a note contributed from the University of California compared the results obtainable in the case of two samples of dry red and white wines by six methods for the determination of alcohol and by five methods for the determination of total solids. They also determined the total acidity figures given by direct titration and by indirect determination. The probable merits of the various methods are briefly considered.

Total neutral and unsaponifiable matter in rosin with data relative to mechanical methods for their determination, M. B. MATLACK and S. PALKIN (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 3, pp. 466–471*).—As one of the results of an investigation reported from the U. S. D. A. Bureau of Chemistry and Soils, it is shown that the determination of the "total neutral" components in a large sample of rosin by a method described in working detail offers an expeditious and accurate means for arriving at the nonacid content of rosin. "Subsequent saponification of the total neutral directly on the 'neutrals', rather than on the original rosin (or 'unsaponifiable' by difference) can then be made easily and accurately."

Studies on flour bleaching, V. E. MUNSEY (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 3, pp. 489–502*).—In a discussion contributed from the U. S. D. A. Food and Drug Administration the author proposes the following systematic examination for bleaching: "A. Determine gasoline color value: (1) Gasoline color value over 1.10, bleaching very improbable. (2) Gasoline color value between 0.75 and 1.10, possible bleaching indicated. Continue under B. (3) Gasoline color value under 0.75, bleaching very probable. Continue under B. B. Bleach residues: (1) Test for benzoic acid. Positive test indicates Novadelox. (2) Determine nitrites. More than 0.38 p. p. m. indicates Alsop process. (3) Quantitative determination of chlorine in fat of flour. Make flame test. (a) Positive flame test for chlorine. Determine chlorine by Beta Chlora procedure. More than 25 p. p. m. Cl indicates bleaching with Cl or Beta Chlora. (b) Negative flame test for chlorine. Determining chlorine in flour fat by Agene procedure. More than 2.5 p. p. m. Cl indicates Agene process. C. No positive results under B (1), (2), or (3) indicate bleaching by long storage."

Methods are discussed, and some modifications are proposed.

Freezing storage in relation to microbial destruction and retention of quality in sweet cider, J. A. BERRY and H. C. DIEHL (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 157–159*).—At the Frozen Pack Laboratory, Seattle, Wash., there was noted a rapid decrease, as much as 90 percent or more, in the numbers of viable organisms contained in sweet cider of fair commercial qual-

ity frozen at —5°, 15°, and 20° F. Where some frozen CO_2 was included in the cans just before sealing, the destruction at these temperatures was 99 percent plus. Cider did not become sterile from prolonged freezing, though when thawed in unopened containers its keeping qualities showed improvement. A temperature of 28° was not sufficient to suppress microbial growth, except for a short time. At —5° satisfactory preservation was accomplished in airtight or nonairtight containers, color, flavor, and odor were best retained, and the corrosive action on metal containers was permanently suppressed.

AGRICULTURAL METEOROLOGY

Forecasting from synoptic weather charts, R. H. WEIGHTMAN (*U. S. Dept. Agr., Misc. Pub. 236 (1936), pp. 47, figs. 20*).—This bulletin brings up to date previous bulletins of the Weather Bureau on the same subject (E. S. R., 63, p. 314). It "has been prepared primarily to serve the needs of those who have a working knowledge of meteorology and are beginning to make deductions from synoptic weather charts. It is not a complete treatment of the subject, nor does it contain any new principles. It does, however, outline some of the more important considerations that should be borne in mind in making weather predictions from synoptic charts."

Of seasonal forecasts, the bulletin says: "The Weather Bureau is hopeful that means will be devised whereby the general character of the weather for a season may be foretold, and to this end is prosecuting a study of the problem so far as its means permit. Thus far, however, no basis has been discovered that is sufficiently sound and reliable on which to make and publish predictions for a season or longer, in advance."

Climatological summary for 1934, C. A. PATTON and W. H. ALEXANDER (*Ohio Sta. Bul. 561 (1936), pp. 126–132*).—The usual tabular summaries of data on temperature, precipitation, and frost-free periods are given for Wooster and the State. The outstanding feature of the weather of the year was deficiency of rainfall. "The total rainfall for the first 5 mo. of 1934 was only 8.15 in., which is the lowest record for these months in 46 yr., including the drought year of 1930. However, the rainfall for June, August, and September was above the average. The total for the year was 29.9 in., which is the lowest yearly fall since 1888, with the exception of the year 1930, when the total was 28.78 in. . . . The seeding and growth of spring crops was unsatisfactory. The wheat and hay crops were also seriously handicapped by the lack of moisture. The latter part of the season, however, was more favorable, and the corn crop in general was the best for many years." The mean temperature for the year was near the average. The growing-season frost-free period was 151 days.

Snow cover in the wintering of crops [trans. title], I. I. TUMANOV, I. N. BOBODINA, and T. V. OLEĬNIKOVA (*Trudy Prikl. Bot., Genet., i Selek. (Bul. Appl. Bot., Genet., and Plant Breeding), 3. ser., No. 6 (1935), pp. 3–57, figs. 26; Eng. abs., Sum. [Sect.], pp. 1–4*).—Controlled experiments with wheat and rye in wooden boxes and observations in the field showed that snow cover under certain conditions prevents winter-killing of such crops, but if the cover is deep and of long duration it may kill them. It is stated that up to the present time killing of winter crops under a deep snow cover has been explained by smothering of the plants, but this article shows that killing of crops under such conditions is a rather complex and long process, involving exhaustion of carbohydrates in the plants, breaking down of protein substances, and weakening of the plants by snow mold. The protective influence of the snow cover de-

pends primarily on regulation of temperature and maintaining a high moisture content of the air. "Successful wintering of crops is insured not so much by a certain depth of the snow cover as by the winter temperature of the crop, determined not only by the thickness of the snow cover but also by the degree of its porosity, the temperature of the air, the degree in which the soil is frozen, and other conditions. Both very low temperatures and temperatures near to 0° are dangerous to winter crops under snow."

SOILS—FERTILIZERS

[Soil investigations by the New Haven Station] (*Connecticut [New Haven] Sta. Bul. 381 (1936), pp. 169, 170, 188–190, 190–192*).—This work has included the utilization of soil surveys for land-use planning, soil-testing, experiments on a magnesium-deficient soil, and investigations of changes in status of soil after nitrogenous fertilization, of fertilizers for vegetable crops, of drainage losses under dolomitic lime treatment, of the data yielded by forest lysimeters, and of moisture in forest soils.

[Soil investigations by the Hawaii Station] (*Hawaii Sta. Rpt. 1935, pp. 6, 7*).—The report very briefly notes work on the composition of the colloids of Hawaiian soils and a study of the Mitscherlich pot method.

[Soil investigations by the Ohio Station] (*Ohio Sta. Bul. 561 (1936), pp. 20–23, 56, 57, figs. 2*).—These investigations dealt with oxidizing conditions in Ohio subsoils, reported by R. Bradfield and H. Kohnke; a study of erosion losses of soil from soil fertility plats, by G. W. Conrey and E. M. Burrage; and the improvement of acid and of alkaline mucks, by E. E. Barnes and D. Comin.

Studies on Podzols and Brown forest soils, II, K. LUNDBLAD (*Soil Sci., 41 (1936), No. 4, pp. 295–313, figs. 7*).—The Podsol and Brown forest soil profiles described in the first part of this paper (E. S. R., 71, p. 14) were further investigated by means of methods aiming at determination of the amphoteric properties of the soil colloids, the laboratory work having been carried out at the New Jersey Experiment Stations.

It is shown that base exchange, cataphoresis, ultimate pH, exchange neutrality, and combining capacity give reliable information concerning soil-forming processes and more or less accurate distinctions between the soil types investigated. Theoretical discussion shows that the methods can also be applied for the same purpose in the case of other soil types. Methods such as determinations of the ultimate pH, the pH of exchange neutrality, and the combining capacity at different pH were found to permit a "rapid and conclusive" comparative study of the soil-forming processes in different soil regions.

"The theory of Mattson [E. S. R., 56, p. 115] of isoelectric weathering is confirmed. The results show that all the soils tested have developed through an acid type of weathering, the Podsols being the result of a most acid weathering, the typical Brown forest soil originating from a less pronounced acid weathering, and the 'aclimatic' Brown forest soil taking a middle position between those two soil types, just as could be expected from their occurrence in nature."

Soil survey of Oscoda County, Michigan, J. O. VEATCH ET AL. (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], ser. 1931, No. 20, pp. 42, figs. 2, map 1*).—This survey was conducted in cooperation with the Michigan Experiment Station and the Michigan Department of Conservation.

Oscoda County covers 364,800 acres of mostly well-drained highland glacial plain in the northeastern part of the Lower Peninsula. Of the 20 series of 24

types recorded, the more extensive areas are 34.1 percent of Grayling sand and 26.3 percent of Roselawn sand. "It is estimated that less than 5 percent is nonarable or difficult to manage."

Chemical analyses of some of the soils and a correlation of the soil types with the vegetation are included.

Soil survey of Hubbard County, Minnesota, P. R. McMiller et al. (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1930, No. 38, pp. 33, figs. 2, map 1*).—Hubbard County occupies an area of 596,480 acres of lands for the most part nearly level to rolling in surface relief, drained by tributaries of the Mississippi River, and located in the forested section in the north-central part of the State.

In this survey, made in cooperation with the Minnesota Experiment Station, the soils of Hubbard County are classified as 15 series, inclusive of 20 types. With the inclusion of a hilly phase, Rockwood sandy loam occupies 33.1 percent of the area surveyed and is outstanding in areal extent among the mineral soils of the county. Of organic soils, peat totals 12.4 percent.

Soil survey of Dillon County, South Carolina, W. J. Geib et al. (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1931, No. 17, pp. 54, pls. 2, figs. 2, map 1*).—Dillon County is an area of 261,120 acres in northeastern South Carolina. In surface relief the county varies from flat to slightly sloping and rolling. "There are large bodies of typical flatwoods, most of which lie at some distance from the streams." These areas have no streams and no natural drainage. The well-drained soils form about 60 percent of the county.

Of the soils and unclassified lands here listed, swamp, which constitutes 11.1 percent of the county, is the most extensive. Coxville clay loam, one of the group of "light-colored poorly drained soils", follows with 10.1 percent. The classified soils amount to 16 series, in which are included 26 types. Muck and meadow constitute 3.1 percent.

This survey was made in cooperation with the South Carolina Experiment Station.

Hydration of minerals and soil colloids in relation to crystal structure, W. P. Kelley, H. Jenny, and S. M. Brown (*Soil Sci., 41 (1936), No. 4, pp. 259–274, figs. 20*).—From experimental data and theoretical considerations here presented, the authors of this contribution from the California Citrus Experiment Station conclude that soil colloids apparently "contain water of crystallization or, more precisely speaking, OH ions, as parts of a crystal lattice structure. This may be considered as an independent proof of the crystalline nature of the colloidal particle. Unlike the minerals of known structure, the soil colloids lose their lattice water at lower temperatures. Whether this is caused merely by particle size or indicates a structural peculiarity, or both, must be further investigated. At least two major classes of soil colloids appear to exist—those which resemble in some measure kaolinite and halloysite, and those which appear to be related to (but not identical with) beidellite. In all cases, however, the composition of the surfaces seems to be rather similar; Si-O-Si planes and possible OH planes probably exist, and planar water dominates over broken-bond water."

Soil swelling.—II, Swelling of soil in solutions of electrolytes: Microscopic and X-ray investigations, D. I. Sideri (*Soil Sci., 41 (1936), No. 4, pp. 275–293, pls. 3, figs. 9*).—Continuing experiments of which the first report has recently been noted (E. S. R., 75, p. 18), the author made a study of the effect of electrolyte solutions on the swelling, absorption, and structural stability in a columnar "alkali" soil and in a loamy Chernozem. The salt solutions studied, with the exception of those of sodium and magnesium chlorides,

lessened the degree of swelling, as did the sulfuric acid solutions (0.1 N and 0.5 N). Also, "it was found that the curve of absorption has an opposite trend to the curve of swelling. The curve of absorption may be regarded as the curve of the coagulation of the sol of the soil colloid.

"Microscopic investigation confirmed the method by which a sharp difference between structural and structureless soil was established on the basis of absorption of water and of inert liquids by soil. Microscopic investigation of swelling in solutions of electrolytes gives results coinciding with the values found for 'swelling solution.' This confirms the correctness of the choice of 'swelling water' ('swelling solution') as an indicator determining the process of swelling in its proper quality.

"Roentgenographic investigation of suspensions isolated from structural and structureless soils showed that they contain but slight amounts of crystalline substance, the prevalent mineral of which is quartz. It is demonstrated that crystalline substance takes no part in the process of swelling. The main mass of the suspension of columnar alkali soil consists of amorphous substance with which the process of change is closely connected."

Capillary conductivity data for three soils, L. A. RICHARDS (*Jour. Amer. Soc. Agron., 28 (1936), No. 4, pp. 297–300, fig. 1*).—Curves which show the relation between the capillary conductivity and the moisture percentage for a sand, a loam, and a clay soil are given in a contribution from the Iowa Experiment Station. The relation of these curves to such important moisture characteristics of soils as water storage, drainage, and maximum heights of capillary rise from a water table is pointed out.

It was found, in part, that "with the soils for which data are given in this paper, the conductivity cut-off points were not actually reached, but it is seen that for the sand and clay soils used the conductivity values become small at moderately low tensions. It is evident that porous clay apparatus for measuring or controlling the capillary tension of soil can be successfully used only at moisture contents where the conductivity is appreciable."

Changes in the oxidation-reduction equilibrium in soils as related to the physical properties of the soil and the growth of rice, M. B. STURGIS (*Louisiana Sta. Bul. 271 (1936), pp. 37*).—The author finds that "development of a low oxidation-reduction potential in a waterlogged soil is largely dependent on the decomposition of active organic matter in the soil. The addition of fresh organic matter to submerged soils causes a rapid lowering of the Eh. In the cases observed, where the fresh organic matter was added, the greatest intensity of reduction was developed within approximately the first 3 weeks, following the submergence of the soil. The lowest oxidation-reduction potentials observed varied from Eh 0.04 to 0.09. It was definitely shown in a soil in which the organic matter had been previously depleted by cropping to rice that the Eh was only lowered from 0.67 to 0.47 by waterlogging in the absence of active organic matter. . . .

"Rice plants growing in a flooded soil will tolerate the presence of large amounts of soluble iron and manganese if the soil is well supplied with actively decomposing organic matter. In the absence of easily decomposable organic matter in a deflocculated soil, large amounts of iron compounds were found to be precipitated on and around the older roots of the rice plants. Presumably, this is due to the low production of carbon dioxide in the soil and to the excretion or diffusion of oxygen from the roots."

It was found that flooding the soil caused small losses of soil nitrogen by denitrification, but the solubility of phosphorus was markedly lowered by the development of reducing conditions. The application of leguminous organic

matter was found to increase the yield of rice in a deflocculated soil. The use of commercial fertilizers without the addition of organic matter was not effective.

"Applications of sulfur and gypsum in various combinations were found to be effective in increasing the permeability of deflocculated soil. However, the indications are that it would not be advisable to apply either sulfur or gypsum immediately before planting a crop of rice, for sulfides would tend to be formed in the soil after irrigation. Under the conditions where sulfides were found in the largest amounts, precipitates of sulfides occurred on the roots and reduced the yields of rice."

Twenty years of soil fertility investigations, R. I. THROCKMORTON and F. L. DULEY (*Kansas Sta. Tech. Bul. 40 (1935), pp. 57, figs. 5*).—This bulletin summarizes rather fully the results obtained on the soil-fertility project at the station at Manhattan, during the 20-yr. period from 1911 to 1930, the work having consisted of comparisons of several different cropping systems, including numerous fertilizer and other soil treatments. Among the numerous and detailed conclusions are the following:

"In the 16-yr. rotation the yield of alfalfa has been materially increased by some treatments. Manure, superphosphate, lime, potassium sulfate, and complete fertilizer gave increases ranging from 528 lb. per acre for superphosphate to 1,404 lb. for a combination of manure and lime. Corn yields were not increased in this rotation by applications of superphosphate, but small increases were obtained from manure. The yield of wheat was increased by most of the fertilizer and manure treatments. Wheat following bromegrass gave slightly higher average yields than after alfalfa. Corn gave slightly increased yields after alfalfa, but the differences were not great.

"In the 3-yr. rotation corn yields were increased by manure and complete fertilizers, but the other treatments were ineffective. Wheat gave increases from the use of superphosphate. Cowpea yields were increased by potassium sulfate, complete fertilizers, and manure, but not by superphosphate alone. Continuous wheat yields were increased by all fertilizers and manure, but the green manure plat gave a yield slightly below the check. The highest yield was from manure 2½ tons annually. Continuous corn has shown some increase from each treated unit. However, the rock phosphate used with green manure did not increase the yield over that of green manure alone. Continuous alfalfa has given the largest increase from a 5-ton application of manure. Superphosphate and rock phosphate gave some increase, but lime and manure gave only about 300 lb. more hay than manure alone."

As regards rotations, "there seem to be certain conditions where continuous cropping, or at least continuous cropping for a considerable period of years, may be more remunerative and in some cases less exhaustive of soil fertility than certain types of rotations. To obtain the greatest value from the use of a rotation the crops and crop sequence must be carefully considered. High-priced crops grown continuously, at least for a considerable period, may be more valuable than a crop rotation which introduces some crops having a much lower acre value."

Soil-management and crop-production studies: Carbon County area, I. D. ZOBELL (*Utah Sta. Bul. 270 (1936), pp. 24, figs. 3*).—The soils of the section studied belong to the Billings series, are mostly the very fine sandy loam, and are underlain by Mancos shale, which contains large amounts of soluble salts.

"These soils are low in organic matter and tend to absorb water slowly. The addition of humus to the soil increases its water-holding capacity and

decreases soil-management problems. Practically every farm in this region has its own soil-alkali problem caused by overirrigation and canal seepage. Of all crops tested, asparagus, sunflowers, barley, and sugar beets are most resistant to alkali. Erosion gullies are increasing at an alarming rate in this region, for which overgrazing is responsible to a large extent. Fall plowing is better suited to local conditions than spring plowing. The cultipacker is a most useful implement for seedbed preparation. For deep-seeded crops, preirrigation has given best results. The corrugation method of irrigation has proved the most satisfactory and is the most widely used in this section." "Nearly all vegetables produced satisfactory crops for the home garden. Everbearing raspberries and strawberries apparently are especially adapted to this section."

"Phosphorus fertilizer in the form of treble superphosphate increased the yield of sugar beets, corn, wheat, and alfalfa. Tests indicate that barnyard manure supplemented with phosphorus is one of the limiting factors in crop production. Nitrogen and potassium fertilizers neither increased nor decreased crop yields. Phosphorus fertilizer continued to give increased yields of alfalfa after 15 crops had been harvested. It also increased the phosphorus, calcium, magnesium, and crude protein content of hay."

"Siberian elm and Russian olive trees are recommended for windbreaks and wood lots in the Carbon County section."

Muck-soil management and crop-production studies: Sanpete County Experimental Farm—1927 to 1933, inclusive, LEMI WILSON (*Utah Sta. Bul. 267 (1936), pp. 28, figs. 3*).—Experiments continued from 1927 to 1933 at the Sanpete County Experimental Farm showed that "muck soil, if properly managed, will produce satisfactory yields for a number of crops." The results of various fertilizer treatments indicated, in general, that, in addition to some rotation to maintain crop yields on a high level, farm manure or superphosphate is necessary.

Fertility maintenance by rotation and manure, D. W. PITTMAN (*Utah Sta. Bul. 271 (1936), pp. 12, fig. 1*).—At the irrigated Greenville Farm of the station it was found that, for the crops, cropping systems, and conditions considered, manure is essential to the maintenance of the productivity of the soil, especially for sugar beets; a good rotation is essential to the maintenance of the productivity of the soil, especially for the cereal crops; "rotations including alfalfa for several years are superior for maintaining productivity to those with annual legumes or no legumes at all; [and] the nitrogen and organic matter in the soil may be maintained by the use of rotations including alfalfa and the careful return to the soil of the manure produced by feeding the alfalfa."

The effect of different plant materials, lime, and fertilizers on the accumulation of soil organic matter, L. M. TURK and C. E. MILLAR (*Jour. Amer. Soc. Agron., 28 (1936), No. 4, pp. 310–324, figs. 2*).—The investigation here reported was carried out at the Michigan Experiment Station, crop residues of various kinds having been added to 1-gal. jars of Hillsdale sandy loam, which were then maintained at about one-third of the water-holding capacity. The organic materials were added on the basis of air-dry weight. About 3 in. of stem were included with the alfalfa and sweetclover roots in order to duplicate closely field cutting by machine. Before thoroughly mixing the organic materials with the soil, they were air-dried and ground. The soils were mixed once every 2 mo.

Analyses were made for total carbon, total nitrogen, nitrates, and total combustible loss (loss on ignition) at the beginning of the experiment and at the end of each 4-mo. period thereafter for 2 yr. Total carbon was determined by

the use of a Fleming combustion furnace and ascarite absorbent, total nitrogen by the Kjeldahl method, nitrates by the reduction method (using Devarda's alloy), and combustible loss by using a muffle furnace. At the end of 2 yr. the moisture-holding capacities of the soils were determined by the Hilgard cup method and the moisture equivalent determined by the method of Bouyoucos (E. S. R., 74, p. 161). The results were, in part, as follows:

Materials with a wide carbon-nitrogen ratio lost a larger percentage of their carbon than those with a narrower ratio. A loss of 69 percent or more of the added organic matter occurred in 2 yr. in every soil except that to which muck was added. Most of this loss occurred during the first 4 mo. of the study. "Since the experiment was set up in the greenhouse, decomposition proceeded faster than it does under most field conditions due to the higher temperature, but the same relative differences in the variously treated soils would probably be obtained in the field." Thirty-five percent of the added carbon in the alfalfa plants and 34 percent in the sweetclover plants remained in the soil at the end of 2 yr., whereas only 25 percent of that of the straw was present at that time. The addition of $(NH_4)_2SO_4$ to straw resulted in the accumulation of more organic matter, although the increase was not great. The carbon-nitrogen ratios were narrowed to or below that of the check in every instance except where muck was used.

Large quantities of nitrates accumulated with all treatments. The greatest accumulation of nitrates occurred with the additions of leguminous materials, whereas the smallest accumulations followed additions of muck and straw. In most cases lime did not show a consistent effect on the quantity of nitrates accumulated (the original soil had a pH of 5.5). Straw added with leguminous materials delayed the accumulation of nitrate nitrogen, and under field conditions this would decrease leaching losses of nitrate nitrogen. The results indicated that under conditions where organic matter of a wide carbon-nitrogen ratio, for example straw, is plowed under, a treatment with a nitrogen fertilizer will overcome the depressing influence on nitrate accumulation and will also tend to retain more of the organic matter or carbon in the soil.

In most cases lime increased organic matter decomposition, "as would be expected in an acid soil." Under field conditions, it appeared that the increased crop residue obtained with the use of lime will offset the increase in the rate of decomposition of the soil organic matter occasioned by the lime.

A high correlation coefficient was found when differences (increases over check) in soil organic matter were correlated with differences (increases over check) in water-holding capacity. "Since soil moisture is, in general, the greatest limiting factor in the production of potatoes, and of many fruit and truck crops, on the sandy soils of Michigan, it would seem logical and economical from the results reported herein to add large quantities of organic material to these soils for the main purpose of increasing their water retentiveness. The leguminous or more nitrogenous materials are most effective for this purpose, while straw and similar carbonaceous material supplemented with liberal applications of commercial nitrogen may also be used."

The effect of certain management practices on the amount of nitrogen in a soil, P. E. KARRAKER (*Jour. Amer. Soc. Agron., 28 (1936), No. 4, pp. 292–296*).—From 1923 to 1933, small plats were handled in duplicate on the Kentucky Experiment Station farm at Lexington, as follows: (1) Kept bare by scraping, (2) in continuous bluegrass, and (3) in continuous bluegrass and white clover. "Sweetclover grew in bluegrass-white clover plats in the first half of 1925, and an appreciable part of the vegetation in the bluegrass plats during the latter years of the experiment was volunteer nonlegume plants. Vegetation was

vigorous on the bluegrass-white clover plats during the experiment, but poor on the bluegrass plats after the first few years of the experiment. Vegetation was removed from the plats at certain times through 1928. Thereafter the plats were clipped several times a year and the clippings left on the plats."

Nitrogen was determined in the 0- to 6-in. and in the 6- to 18-in. soil layers of the plats at the beginning of the experiment and again in 1931. The average change in nitrogen during this period in the soil of the plats to a depth of 18 in. was, for the bare plats, 530 lb. loss per acre; for the bluegrass plats, 62 lb. gain; and, for the bluegrass-white clover plats, 405 lb. gain. The average nitrogen content of the vegetable material removed from the plats was, for the bluegrass plats, 70 lb. per acre; and, for the bluegrass-white clover plats, 278 lb.

Registration, labeling, and inspection of commercial fertilizers, 1935, F. B. MUMFORD, L. D. HAIGH, and E. W. COWAN (*Missouri Sta. Bul. 361 (1936), pp. 42*).—This bulletin presents, for the 1935 season, the usual report on the inspection analyses and very briefly discusses a number of related topics, including the question of basicity of fertilizers and the use of high grade fertilizer mixtures in Missouri.

AGRICULTURAL BOTANY

Botany and human affairs, A. F. WOODS (*Science, 81 (1935), No. 2111, pp. 573–578*).—This address at the twenty-fifth anniversary exercises of the Brooklyn Botanic Garden (May 13, 1935) summarizes some of the relations of botany to human welfare, including discussions of the fundamental transformations by bacteria that are necessary to higher forms of life; the losses from the effects of fungi on living plants and on food products; plants as foods, as soil builders, in the conservation of soil moisture, and in erosion control; the results of plant breeding for finer varieties and for disease resistance; the value to man of plant physiological studies; and finally some examples of unpredictable practical applications of "pure science" researches in the botanical field.

Six decades of the modern era in botanical science.—I, Symposium: Teaching general botany (*Iowa State Col. Jour. Sci., 9 (1935), No. 2, pp. 215–321, pl. 1, figs. 5*).—The contributed papers contain comments and suggestions relative to the foundation plant science course required of most college students in agriculture. The authors are I. E. Melhus, C. E. Friley, E. A. Bessey, R. J. Pool, E. W. Sinnott, G. S. Bryan, H. C. Sampson, S. M. Dietz, W. H. Lancelot, C. F. Hottes, H. W. Rickett, L. W. Durrell, and W. A. Kreutzer.

[Botanical studies by the Ohio Station] (*Ohio Sta. Bul. 561 (1936), pp. 38, 39*).—Progress reports are given of studies in evaporation (using both black and white atmometers), by J. D. Wilson; and in the use of the quinhydrone electrode for determining the pH of solid bacteriological culture media, by P. E. Tilford.

Respiration, W. STILES (*Bot. Rev., 1 (1935), No. 7, pp. 249–268*).—This critical review of work on plant respiration, including 47 literature references, deals with the influence of external conditions on respiratory activity, the effect of the respiratory substrate on respiratory activity, variations in respiratory activity during development, the respiratory quotient, anaerobic respiration, and the relation of the rate of carbon dioxide output to the rate of loss of substrate.

The effect of light on transpiration, H. F. SMITH (*Ann. Bot. [London], 50 (1936), No. 197, pp. 155–159*).—"Examination of the data of Henderson [E. S. R., 58, p. 725], who concluded that light had a direct effect on transpiration apart

from any heating effect or effect on stomatal aperture, leads to the view that the increased transpiration observed (of the order of 4 percent) may, in fact, have been due to the small rise in temperature of the leaves resulting from the absorption of radiant energy."

The action of alpha irradiation on protoplasm and on chloroplasts [trans. title], R. BIEBL (*Protoplasma, 24 (1935), No. 2, pp. 225–257, figs. 14*).—The experiments were performed with the alpha emanations from polonium preparations as affecting *Bryum capillare*.

A note on photo-periodism in sesamum, D. RHIND (*Indian Jour. Agr. Sci., 5 (1935), No. 6, pp. 729–736, pls. 3*).—The so-called "late" sesamums (Burmese "hnangyi") proved to be typical short-day plants which grew and reproduced normally only with days of about 12 hr. or less. With 13 hr. of light abnormal growth and suppression of flowering followed.

The "early" sesamums (Burmese "hnanyin") were not restricted to any particular day length, flowering and fruiting with either long or short days, though the growth and yield were best with long days.

Photoperiodism and frost resistance of perennial plants [trans. title], B. S. MOSHKOV (*Trudy Prikl. Bot., Genet., i Selek. (Bul. Appl. Bot., Genet., and Plant Breeding), 3. ser., No. 6 (1935), pp. 235–261, figs. 7; Eng. abs., Sum. [Sect.], pp. 17–19; abs. in Ann. Agron. [Paris], n. ser., 6 (1936), No. 1, p. 164*).—Experiments with perennial plants, chiefly ligneous, indicated that their frost resistance "depends on their photoperiodical response. By altering the photoperiodical growth conditions of a plant, we may, within limits, depending on its hereditary disposition, change its frost resistance towards increase or decrease. Thus, from the point of view of selection and breeding, frost resistance is a secondary character frequently depending not on critical winter temperatures, but on the conditions of the vegetation period, in particular on photoperiodical conditions selecting the suitable forms. . . . Frost resistance . . ., as any other resistance, cannot be reduced merely to some external change, as in turn it is inseparably connected with the general condition of the plant organism. . . . Photoperiodism must be regarded as a new stage in the study of frost resistance in plants."

Response of crops to spring frosts [trans. title], S. M. IVANOV (*Trudy Prikl. Bot., Genet., i Selek. (Bul. Appl. Bot., Genet., and Plant Breeding), 3. ser., No. 6 (1935), pp. 199–220, figs. 8; Eng. abs., Sum. [Sect.], pp. 14, 15*).—Plants grown under conditions of a vegetation experiment and subjected to freezing in refrigeration chambers and in a cool greenhouse at temperatures of from —1° to —8° C. were either killed or altered in growth and reduced in yield. It was observed that the degree of yield as a result of the low temperatures depended on the hereditary properties of the variety as well as on the temperature at which freezing had taken place. It is suggested that in order to prevent possible cases of winter-killing, frost-hardy varieties should be selected and bred.

Frost ring formation in some winter-injured deciduous trees and shrubs, H. A. HARRIS (*Amer. Jour. Bot., 21 (1934), No. 8, pp. 485–498, pls. 2*).—Freezing temperatures in March 1932, following an exceptionally mild winter in Illinois, resulted in severe winter injury to various species of trees and shrubs. The extensiveness and severity of the injury were determined chiefly by the degree of progress in growth activities attained before the freezing temperatures. The histological changes in the frost rings found in all affected species were studied and are here reported.

The increase of physiological combustion in the presence of potassium and phosphorus and the prevention of freezing of plants, J. STOKLASA

(*Ernähr. Pflanze, 32 (1936), No. 2, pp. 27–31, 40; Eng. abs., p. 40*).—The published data on the subject, including recent studies, are reviewed, following which the author reports on his own results as indicating that radioactivity (and consequently the radioactive potassium salts) favorably influences the vitality of the cell and thus increases the plant's resistance to freezing. In pot experiments with sugar beets, potatoes, cucumbers, carrots, and tomatoes the energy of respiration was greater in the plants receiving potash than in those receiving none. Increases or decreases in the energy of respiration were accompanied by corresponding increases or decreases in resistance to freezing.

New contribution to the investigation of development stages in wheat, S. ſA. KRAEVOĬ (S. KRAJEVOI) and F. G. KIRICHENKO (F. KIRIČENKO) (*Dok. Akad. Nauk S. S. S. R. (Compt. Rend. Acad. Sci. U. R. S. S.), 1 (1935), No. 2–3, pp. 171–176, figs. 3; Eng. abs., pp. 175, 176*).—The method of differential exposure to light (so-called "hardening") applied to jarovized winter wheat Novokrimka 0204 (*Triticum vulgare erythrospermum*) showed the passage of the plants through the different stages of their development with definite regularity. It is believed that the same method might confirm the data of T. D. Lysenko as to the presence of two developmental stages in wheat, viz. a temperature-sensitive (jarovization) and a light-sensitive stage.

The development of the reproductive organs in wheat shows that the formation of germ cells and their reproductive ability are determined by certain inner qualitative changes in the gametophyte, and viable gametes are not formed until these changes have been effected. The nature of the gametogenesis and of the final ripening of the gametes leads, in connection with the differential exposure to light, to the detection of a third stage in the ontogenetic development of the wheat plant, which is connected with the formation of the reproductive organs.

Biochemical studies in the nitrogen metabolism of the apple fruit.—II, The course followed by certain nitrogen fractions during the development of the fruit on the tree, A. C. HULME (*Biochem. Jour., 30 (1936), No. 2, pp. 258–268, figs. 9*).—The methods of sampling and preparation of the fruit for analysis are detailed, the separation of the total nitrogen into the protein and nonprotein fractions and the reasons for the use of alcohol extraction to attain this end are discussed, and the methods for the estimation of total nitrogen and its fractions are given. Graphs show the changes in size of fruit; total and total soluble nitrogen; ammonia, asparagine, amino acid, and "rest" nitrogen; and the titratable acidity during the course of development of the fruit. The nitrogen fractions are given for both the peel and the pulp.

The studies are believed to indicate that there are three stages in the nitrogen cycle of the developing apple fruit. The results for free ammonia and amino acid nitrogen and for titratable acidity do not favor the theory that acid formation in plants is intimately connected with the nitrogen metabolism.

Photosynthesis and carbohydrate exchange in the banana (Musa japonica) in relation to the structural characters of the leaves [trans. title], A. KURSANOV (KOURSANOV) and S. MANSKAĬA (MANSKAJA) (*Biūl. Moskov. Obshch. Isp. Prirody, Otd. Biol. (Bul. Soc. Nat. Moscou, Sect. Biol.), n. ser., 44 (1935), No. 4, pp. 205–217, figs. 4; Fr. abs., pp. 216, 217*).—From this study of banana leaves and petioles it is concluded that photosynthetic activity does not go on uniformly over the leaf blade, but diminishes perceptibly from the base toward the tip.

The leaf is characterized by an insufficiency of phloem and xylem tissues in relation to the size of the blade. Its assimilatory apparatus thus experiences difficulty in both water intake and discharge of the products of assimilation, with the result that the upper part of the leaf blade becomes overcharged with assimilatory products and the photosynthetic activity decreases. These difficulties in the water economy are in part compensated for by the development of a thick layer of water-bearing tissue between the palisade tissue and the spongy parenchyma, but full equilibrium is not attained in all parts of the blade (lower water content of the tip as compared with the base). The lowering of the turgidity toward the tip is one of the principal causes of the diminished intensity of translocation from such parts.

The predominating sugar in the leaves is sucrose. Maltose occurs in less amount, and invert sugar is absent. The translocation of the assimilatory products from the blade into the petiole is accompanied by an increased inversion of the sucrose, with the result that in the petiole the relations between sucrose and invert sugar are reversed. Hemicellulose is the principal polysaccharide in all parts of the plant. The carbohydrate content, particularly that in soluble sugars, diminishes during the passage of the assimilatory products from the leaves to the fruit.

Preliminary calculations of the productivity indicated that in 24 hr. the average accumulation for seven leaves with a total surface of 87,500 cm^2 was about 35 g of organic material. By fresh weight this would give a daily increase of 150 g for the plant. The rapid growth of banana plants is thus elucidated.

The translocation of carbohydrates in maize, W. E. Loomis (*Contrib. Iowa Corn Res. Inst.* [*Iowa Sta.*], *1 (1935), No. 1, pp. 101–112, figs. 6*).—The results of these studies are believed to indicate that the food materials elaborated by the lower leaves move downward in the young plant. This current is reversed, however, after fertilization, when the ear dominates the food supply of the plant, a dominance leading in extreme cases to premature death of the roots from starvation alone or more commonly with complicating, weakly parasitic diseases. Hypotheses as to the mechanism of this reversal are discussed, and, though a choice among them is not made, a metabolic stimulus, electrically transmitted, is thought to satisfy the known conditions.

Temperature, through its effect on growth and possibly also on the phloem activity, seems to be important in determining maximum translocation rates, which in maize probably reach a daily peak at from 2 to 6 p. m. and drop to a low rate by 10 p. m. In many of the tests the sugar content of both leaves and stems reached a minimum at about 8 a. m., suggesting an acceleration by the higher morning temperatures of the translocation and utilization of carbohydrates to a point above the early photosynthetic rates.

The polarity of translocation appeared to be a positive force not explained by any theories extant. When the ear was gaining most rapidly in weight it showed the strongest negative gradient for both reducing sugars and sucrose. In starving maize roots the sugar content was lower than in the central stalk, but in the well-nourished roots of defruited plants the reverse was the case. During the period of most rapid translocation the gradients of total sugar and of all sugar fractions were negative for each tissue between the leaf blade and the cob of the young ear. The positive action of translocation resulted in the piling up of sucrose in the ear shank at night to a value more than five times that of the leaves. Since neither mass flow nor any acceleration of movement along a positive translocation gradient could explain these results, a positive, polarized action within the phloem is postulated.

The effect of potassium chloride on the diurnal changes of the carbohydrates of the potato leaf, D. J. WATSON (*Ann. Bot. [London], 50 (1936), No. 197, pp. 59–83, figs. 4*).—Significant diurnal variations were found in the reducing sugars, sucrose, and starch of the leaflets. More sucrose than reducing sugars was present, and it showed a greater variation. There was evidence that the change from light to darkness induced a rapid accumulation of sucrose derived from starch, and there was some indication of a reverse effect from the change back to light.

The only significant effect on the carbohydrates noted from application of KCl was marked reduction in sucrose during midday. The rate of translocation of carbohydrate during darkness was unaffected by the KCl, but the rate of removal of dry matter was increased. Assuming that the translocation rate was also unaffected at other times, the photosynthetic rate was increased by an increased supply of KCl in the afternoon, but was decreased in the early morning. It is suggested that the efficiency of the photosynthetic mechanism was increased by the KCl, and that the early morning decrease was due to some secondary factor.

The water content per 100 g of dry matter was increased by the KCl, and the increase did not vary with time. The loss in dry matter over the sampling period increased with the increase in KCl, and this was associated with an increased water loss. The use of the residual dry matter basis for expressing carbohydrate changes would have given inaccurate results here, since significant changes in residual dry matter were found.

Mechanism of salt absorption by plant cells, W. J. V. OSTERHOUT (*Nature [London], 136 (1935), No. 3452, pp. 1034, 1035*).—This is a reply to recent criticism by F. C. Steward[1] of some of the author's work on the mechanism of the absorption of electrolytes by the very large, multinucleate cells of *Valonia*. Further comments by Steward follow the present note.

The physiology of tannin in the plant cell [trans. title], W. HAUSER (*Protoplasma, 24 (1935), No. 2, pp. 219–224*).—In order to investigate the mechanism of tannin action in the cell plasma, the experimental conditions must be so arranged in the model experiment that the precipitation reaction of the tannin with protein substances is prevented. Since the weakly alkaline reaction of the plasma in the presence of salts must be taken into account, a procedure is chosen which will neutralize the tannin so that the precipitation reaction with gelatine is prevented. Tannin in this form prevents the aggregation of the particles of a gelatine solution.

From these data it can be deduced that the tannins act as polyvalent phenols with relatively large molecules also in the plasma, and that by their action the formation of coarser dispersions and secondary structures is prevented. If, by their removal, by their union with other substances, or by changes of a chemical nature, their action is checked, then a regulatory function may accrue to the tannins corresponding to the degree of dispersion and related phenomena, like permeability, absorptive power, metabolism, and cell turgor.

Experiments on the leachability of salts absorbed by seeds and its significance for seed stimulation [trans. title], J. KISSER and K. LETTMAYR (*Ztschr. Pflanzenernähr., Düngung u. Bodenk., 34 (1934), No. 3–4, A, pp. 172–181*).—Seed coats of wheat, separated from the seed with a scalpel after soaking, were placed in solutions of $CuSO_4$, $Pb(NO_3)_2$, $ZnCl_2$, $MnCl_2$, and $CoSO_4$ of various known concentrations and for various periods of time. The amount of material absorbed, determined by analysis of the solution and also of the seed coats,

[1] Nature [London], 135 (1935), No. 3414, pp. 553–555.

was relatively large. In a parallel series the seed coats of wheat and peas were washed for various periods of time, following treatment with the salt solutions. All of the $MnCl_2$ and $CoSO_4$ were washed out. The amount of the other salts remaining ranged from 1.4 to 78 percent of the amount absorbed, depending on the salt concentration. Proportionately more was retained where absorption had been from the more dilute solutions. Much less copper was dissolved out by slightly alkaline conductivity water than by slightly acid distilled water, and in water at rest than in moving water.—(*Courtesy Biol. Abs.*)

The value of copper sulphate as a plant nutrient, R. RUSSELL and T. F. MANNS (*Peninsula Hort. Soc.* [*Del.*] *Trans., 47 (1933), pp. 51–57*).—Neubauer tests at the Delaware Experiment Station indicated that as much as 400 lb. of $CuSO_4$ per 2,000,000-lb. acre may be incorporated and still give increased results to corn and wheat. Field experiments indicated that 50 lb. of $CuSo_4$ per ton of fertilizer may be used on corn, potatoes, and other crops with yields increased from 4.5 to 28 0 percent, but when the amount was increased to 200 lb. the yields were decreased. The Neubauer tests might indicate that mechanical difficulties in the distribution of the fertilizer may be responsible for the decreased yields in the heavier applications of $CuSO_4$.

The iron supply of plants in water culture experiments [trans. title], W. SCHROPP (*Ztschr. Pflanzernähr., Dungung u. Bodenk., 42 (1936), No. 1–2, pp. 35–42, fig. 1*).—Comparative water culture experiments were carried out with maize, using nutrient solutions with normal and increased iron content. Maize growth in the v. d. Crone nutrient solution served as control. In the nutrient solutions of Aschoff, Bruch, Knop, and Tollens two additions, each of 2 mg of iron as $FECl_3 6H_2O$, proved wholly insufficient both as to quantity and form. The results also brought out certain relations between the reaction of the medium and the solubility of the iron salt. When in these solutions the $FeCl_3$ was replaced by 5 mg of iron per liter as ferric citrate an essentially higher yield in dry weight of shoots and roots was obtained than in the v. d. Crone solution, and the iron supply bore no relation to the reaction. The yields from the several solutions paralleled the concentration. In the Detmer solution with 28 mg of iron per liter as $FePO_4 \cdot 4H_2O$, development of the maize was better but did not attain the good stand given by the v. d. Crone solution. By increasing the iron content to 38 mg by successive additions of ferric citrate the development and dry weight of the shoots equaled those of the v. d. Crone solution, while the weight of the roots was somewhat higher.

Comparative content of sulfur and phosphorus in plants grown on the same soil [trans. title], G. BERTRAND and L. SILBERSTEIN (*Compt. Rend. Acad. Agr. France, 22 (1936), No. 3, pp. 90–93*).—The authors review their published work on the subject. It is concluded that the varying content of sulfur and phosphorus in the plants studied does not depend solely on the soil composition, but that it depends also, if not exclusively, on the physiological needs of the species and on its ability to satisfy those needs.

The action of some sulfureous mineral waters on the germination of seeds and on the development of plants [trans. title], P. TESTONI (*Ann. Chim. Appl.* [*Roma*], *25 (1935), No. 10, pp. 558–563, figs. 3*).—With wheat and lentils as test plants, the sulfur waters of Telese and of Tivoli (Italy) exerted a stimulative action on seed germination and on plant growth as compared with ordinary potable waters.

The effect of nitrate poisoning on seeds [trans. title], E. GAIN (*Compt. Rend. Acad. Agr. France, 22 (1936), No. 2, pp. 78–80*).—This is a review of a thesis on the subject by H. Yéro.

Water and sand culture experiments on the action of molybdate and tungstate ions [trans. title], K. SCHARRER and W. SCHROPP (*Ztschr. Pflanzenernähr., Düngung u. Bodenk., 34 (1934), No. 5–6, A, pp. 312–322, figs. 2*).—Water culture experiments, with increasing amounts of molybdenum (from 10^{-10} to 100 mg) as sodium molybdate applied to maize growing in nutrient solution, with few exceptions gave decreased yields and root injury. In similar tests with maize, oats, barley, wheat, and rye grown in sand cultures, the rye yields, except for the 100-mg lot, which was seriously injured, were favorably influenced. On the contrary, wheat, barley, oats, and maize were almost throughout strongly injured by the molybdate ion.

In tests with sodium tungstate in water cultures of maize, the tungstate ion induced increases in the dry weights of both roots and shoots, except in the lots given the two highest amounts (10 and 100 mg). In similar tests in sand cultures of wheat, rye, barley, oats, peas, and maize, the last gave increased yields with all amounts of tungstate applied, while the other plants, in general, gave increased yields with all except the highest (100 mg), which was injurious.

On the basis of these results it is concluded that, in general and under equivalent chemical conditions, the molybdate ion is definitely more poisonous than the tungstate ion.

The assimilation of inert matter by the living plant substance: Old conceptions and present orientation [trans. title], R. COMBES (*Rev. Gén. Sci., 47 (1936), No. 1, pp. 4–13*).—This is a review.

The auximone question [trans. title], K. BASSALIK (*Acta Soc. Bot. Polon., 11 (1934), No. 4, pp. 581–660, figs. 4*).—This is a general summary of the status of the auximone problem, and particularly of the author's 8-yr. investigations of the subject, in which he used *Lemna*, *Spirodela*, and *Hormidium*.

Different action of auxin-a and of hetero-auxin.—Preliminary report, J. VAN OVERBEEK (*Natl. Acad. Sci. Proc., 22 (1936), No. 3, pp. 187–190, figs. 3*).—In the tests reported the growth inhibition of oat coleoptiles due to exposure to light apparently did not occur when the actual growth hormone was heteroauxin instead of auxin-a. In inactivation tests auxin-a was considerably more inactivated than heteroauxin.

The use of growth substances in propagating plants from cuttings, A. E. HITCHCOCK and P. W. ZIMMERMAN (*Florists Exch. and Hort. Trade World, 86 (1936), No. 8, p. 11, fig. 1*).—This is a brief account of the salient results of published and unpublished work on auxins at the Boyce Thompson Institute, with possible horticultural applications.

Note on the effect of light on the bioelectric potentials in the Avena coleoptile, W. G. CLARK (*Natl. Acad. Sci. Proc., 21 (1935), No. 12, pp. 681–684, fig. 1*).—In experiments reported in this preliminary note, the tip of the coleoptile of etiolated seedlings of oats (*A. sativa*) was normally electronegative to the base. After illumination (100 w Mazda lamp 40 cm above the tip) this negativity at first decreased, then increased to a maximum and fell again to the original level, usually fluctuating somewhat thereafter.

Polarized growth and cell studies on the Avena coleoptile, phytohormone test object, G. S. AVERY, JR., and P. R. BURKHOLDER (*Bul. Torrey Bot. Club, 63 (1936), No. 1, pp. 1–15, figs. 6*).—The authors report determinations of relative growth rates on coleoptiles and counts and measurements on longitudinal median sections of growing coleoptiles of oats (*Avena*) and wheat (*Triticum*), with the results and interpretations.

"The use of the *Avena* coleoptile as a quantitative test object for auxin has been based on the assumption that the hormone brings about increase in

length only by cell elongation. It has been shown here that cell division takes place in the early stages of coleoptile growth, but this cell division ceases relatively early so that by the time the coleoptile is used for auxin tests, its elongation is directly proportional to the growth in length of its constituent cells. Its use as a quantitative test object for hormones causing cell stretching is, therefore, valid."

Cambial activity in poplar, with particular reference to polarity phenomena, A. B. BROWN (*Canad. Jour. Res., 14 (1936), No. 2, Sect. C, pp. 74–88, figs. 4*).—"Ringing experiments with the aspen poplar, *Populus tremuloides* Michx., lead to the conclusion that cambial activity is definitely not rigidly or unconditionally polar in its development in the root. A much greater development of cambial activity in the morphologically upward direction was obtained in these experiments than has hitherto been observed. It is suggested that the concept of polarity, applied to cambial activity as a process, must be defined in terms of a tendency to develop in the morphologically downward direction, rather than in the morphologically upward direction, in roots and stems. Polarity in relation to cambial activity in general is discussed briefly."

The effect of temporary anaerobiosis on the sprouting of young potato tubers, J. V. RAKITIN and N. N. SUVOROV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 4 (1935), No. 6–7, pp. 295–297*).—The authors subjected potato tubers to temporary anaerobiosis obtained in atmospheres of carbon dioxide, hydrogen, and ether vapor in glass jars with ground glass stoppers. The resulting data bore out their theory that proper periods of anaerobiosis will eliminate the dormancy period, and suggest that all factors promoting the formation of acetaldehyde and ethyl alcohol lead to its elimination.

The amylogenic capacity and organic mass of plastids [trans. title], A. MAIGE (*Compt. Rend. Acad. Sci. [Paris], 201 (1935), No. 26, pp. 1411–1414*).—In order to evaluate comparatively the organic masses of the starch-forming plastids, the author used a "cytophysiological" method consisting of the estimation of the volume of the chlorophyllous masses which they produce in developing into chloroplasts. Using potato tubers and bean hypocotyls as test plants, he concludes from his results that (1) a plastid possesses a catalytic condensative action limited on the one hand by its organic mass and on the other by its exhaustion through the operation of the amylogenic function, (2) this condensative action results from the production of a special catalyzer, and (3) the arrest in the growth of the plastid, occurring when the condensative action is paralyzed by the antagonistic amylasic action, may take place at very diverse stages of exhaustion of the plastid membrane.

The production of root-hairs in relation to the development of the piliferous layer, K. WILSON (*Ann. Bot. [London], 50 (1936), No. 197, pp. 121–154, figs. 12*).—The author reports the demonstration, by observation and experiment on a number of plant species, that if the roots are consistently hairy or non-hairy and do not exhibit alternation from one condition to another the production of root hairs is accompanied by an increase in the dimensions of all the cells of the piliferous layer. This is regarded as further evidence for the theory that root-hair formation is an accompaniment of optimum growth conditions rather than a result of a retardation, and as invalidating root-hair frequency as a measure of the intensity of root-hair formation. The experiments are discussed in detail, and it is stated that the use of the root-hair index, a new criterion here presented, and a due recognition of the time lag between a change in conditions and the completion of the reaction to it of the root, permits the formulation of a logical account of the relationship between the development of the epidermis and the root hairs and explains some of the

earlier divergent results. A number of calculations were made relating to the increase in superficial area of the root surface induced by root-hair formation, and the possible significance of this increase is discussed.

An abnormal method of branching, P. A. DAVIES (*Bul. Torrey Bot. Club, 63 (1936), No. 3, pp. 139–146, pl. 1, figs. 2*).—An abnormal distribution of leaves in *Ailanthus altissima* results in a flattened stem apex with definite growing centers, the areas between which split and give the abnormal branching pattern.

Cell size and organ size in two violet species and their hybrid, J. W. MARVIN (*Bul. Torrey Bot. Club, 63 (1936), No. 1, pp. 17–32, pl. 1, figs. 7*).—This investigation from the Vermont Experiment Station deals with *Viola conspersa, V. papilionacea,* and their hybrid.

Phylogenetic significance of the pores in urediospores, G. B. CUMMINS (*Mycologia, 28 (1936), No. 2, pp. 103–132*).—This is a contribution from the Indiana Experiment Station.

The morphology of the flowers of Rosa and certain closely related genera, G. JACKSON (*Amer. Jour. Bot., 21 (1934), No. 8, pp. 453–466, figs. 15*).—This is a contribution from Cornell University.

Texas flowers in natural colors, including many common plants of the Southwest, E. WHITEHOUSE (*Austin, Tex.: Author, 1936, pp. XVI+212, pl. 1, figs. 181*).—Descriptions are presented of many common plants of the Southwest.

The Actinomyces of the albus group, J. DUCHÉ (*Les Actinomyces du groupe albus. Paris: Paul Lechevalier & Sons, 1934, pp. [3]+375+[1], pls. 4, figs. 32*).—Part 1 gives a general historical summary, discussions of the generic names and of the general classifications relative to the group, and a general bibliography. Part 2 takes up the morphology, cytology, and biochemistry of the group. Part 3 gives a detailed treatment of the albus group of *Actinomyces,* with descriptions of species (some of them new), and includes those of the collection of the Museum of Natural History, Paris. Keys to the species are included.

The morphology and development of Caliciopsis pinea, H. W. MCCORMACK (*Mycologia, 28 (1936), No. 2, pp. 188–196, figs. 21*).—This is a contribution from Cornell University.

Remarks on the life-history of the Rhodophyceae, H. KYLIN (*Bot. Rev., 1 (1935), No. 4, pp. 138–148*).—This is a critical review, with a bibliography of 27 entries.

[Abstracts of papers presented at the thirty-seventh annual meeting of the Society of American Bacteriologists, New York City, December 26–28, 1935] (*Jour. Bact., 31 (1936), No. 1, pp. 31, 32, 91, 92, 93*).—Abstracts of the following papers of botanical interest are included: Fermentation products of the S and R forms of yeasts, by F. W. Fabian and L. J. Wickerham (from the Michigan State College); influence of host plant on effectiveness of Rhizobia, by S. V. Bond, P. W. Wilson, and F. C. Wagner; and studies on the root nodule bacteria of certain wild leguminous plants of Wisconsin, by O. A. Bushnell, W. B. Sarles, and E. B. Fred (the last two from the University of Wisconsin).

Studies of the root nodule organisms of certain wild legumes, M. E. CONKLIN (*Soil Sci., 41 (1936), No. 3, pp. 167–185, fig. 1*).—The nodule organisms of 10 wild legumes and of *Dolichos lablab* were studied as to their morphological, cross-inoculation, and cultural characters, the latter including carbohydrate fermentations, reactions on amino acid media, and sensitivity to salts and dyes. These bacteria fell into the following two groups:

Group I included the nodule bacteria of *Amphicarpa bracteata, Baptisia tinctoria, Cassia nictitans, Crotalaria sagittalis, Desmodium paniculatum, Dolichos lablab, Genista tinctoria, Lespedeza hirta,* and *L. frutescens.* The morphological and cultural characters of this group were essentially as in the cowpea organ-

ism and in *Rhizobium japonicum* of soybeans. On inoculation, members of this group formed nodules (so far as tested) on any other legume of the group; nearly all strains formed nodules on cowpeas, and certain strains on soybeans. Cultures from the *Desmodium* showed irregularity of nodulation on both cowpeas and soybeans, but appeared to form nodules more readily and of more beneficial type on the latter. Further evidence of the relationship of group I bacteria to those of cowpeas and soybeans lay in the cross-inoculation irregularities among strains of the latter, suggesting that the ability to form nodules on any but the original host may be a physiological character absent under certain conditions in all strains of these rhizobia. The group I strains therefore appear to be closely related among themselves and to the cowpea and soybean bacteria both in cultural and cross-inoculation characters. However, variations in the latter prevent the specific naming of these organisms or the definite placing of their hosts in either the cowpea or the soybean inoculation group, under the present criteria for determining species and inoculation groups.

Group II included the nodule bacteria of *Lathyrus latifolius* and *L. japonicus*. The morphological and cultural characters were essentially as in *R. leguminosarum* from *Vicia*, *Pisum*, and certain *Lathyrus* spp. The strain from *L. latifolius* was further characterized by its ability to form nodules on *Vicia* and on other *Lathyrus* spp., and hence the author believes that it should be included in the pea group. The strain from *L. japonicus* was characterized by its ability to form nodules on other *Lathyrus* spp. and by its irregularity in nodule formation on *Pisum* and *Vicia*. This irregularity prevents the placing of *L. japonicus* unreservedly in the pea group, or the conclusion, under the present nomenclatorial rules, that the organism is *R. leguminosarum*.

A "dope" for embedding wax, C. H. WADDINGTON and J. KRIEBEL (*Nature [London]*, *136* (*1935*), *No. 3443*, *p. 685*).—This is a note on the successful use of "petroleum ceresin" added to paraffin to give a finer texture on cooling.

Preparation of transparent specimens of leaves, worms, bees, butterflies, etc., R. H. CABE (*Science*, *83* (*1936*), *No. 2154*, *pp. 355*, *356*, *fig. 1*).—The object is placed in 95 percent alcohol for 48 hr. or more, then into 90 percent (1.2 sp. gr.) formic acid, which dissolves most plant pigments, starches, sugars, gums, dextrins, proteins, etc., but does not dissolve fat, carotene, and such framework material as cellulose, lignin, or the chitin of animal tissues. Three percent hydrogen peroxide or chlorine water is added to plant material in amounts of about 5 ml at a time until it is cleared.

GENETICS

Reproduction and inheritance in Ascomycetes, B. O. DODGE (*Science*, *83* (*1936*), *No. 2147*, *pp. 169–175*).—This address before the botanical section of the American Association for the Advancement of Science presents a general summary of present knowledge of the subject, together with suggestions as to some further promising lines for thought and research. The author concludes with the statement that "it is encouraging to know that fundamentally in their reproduction and inheritance the fungi follow exactly the same laws that govern these activities in the higher plants and animals."

Genetic investigations of bacterial wilt resistance in corn as caused by Bacterium stewarti (Smith) Migula, E. J. WELLHAUSEN (*Contrib. Iowa Corn Res. Inst.* [*Iowa Sta.*], *1* (*1935*), *No. 1*, *pp. 131–139*, *pl. 1*, *fig. 1*).—Tests were made by the station of 56 inbred lines and certain single crosses of maize to determine the relative resistance to bacterial wilt as caused by artificial wound inoculations with *B. stewarti* (=*Phytomonas stewartii*).

"Symptoms and types of reaction varied with the host line. In several of the susceptible lines infection initiated a modification in the development of the vascular bundle. The parenchyma cells around the plugged protoxylem are replaced by heavily lignified cells radiating out in all directions. These show indications of being transformed into conducting elements. This condition was not found in the most susceptible line W–134 and may be a partial explanation as to why it wilts more readily soon after inoculation. All gradations from highly resistant to highly susceptible lines were found. The majority of the field corn inbreds were resistant, the majority of the inbreds of the Evergreen group were intermediate, and the majority of the early sweet corn inbreds were susceptible.

"Dominance of resistance was found in all F_1 material tested. In a few cases the F_1's were more resistant than either of the parents. Results from the backcross and later-generation progenies of the crosses OSF×WF and OSF×W–134 show definite segregation of factors for resistance, with a strong indication that two major dominant complementary genes with perhaps a third, modifying gene were involved."

The effect of inbreeding and of selection within inbred lines of maize upon the hybrids made after successive generations of selfing, M. T. JENKINS (*Contrib. Iowa Corn Res. Inst.* [*Iowa Sta.*]. *1 (1935), No. 1, pp. 21–42, figs. 4*).—Two progenies from the first to eighth generations of inbreeding, inclusive, except for the seventh, of 14 inbred lines each of Lancaster Surecrop corn and of Iodent were topcrossed with Krug in studies in cooperation with the U. S. Department of Agriculture. One progeny from each inbred line in each generation was the selected progeny representing the direct line of descent, while the other represented a sister progeny chosen at random from among those discarded in favor of the one selected to continue the pedigree.

Selection between sister progenies was effective in isolating progenies whose crosses were slightly but consistently more productive than those of their discarded sibs. Selection was ineffective in isolating strains whose crosses differed from those of their parents in productiveness or in any of the other characters studied. The inbred lines acquired their individuality as parents of top crosses very early in inbreeding and remained relatively stable thereafter. The early individuality of the lines in crosses, which should permit their early testing, possibly after the first and certainly after the second generation of inbreeding, is explained on the basis of the numbers of dominant genes present as well as the particular genes present. Essentially equal numbers of dominant allelomorphs will be preserved through the successive generations of selfing. Selection for performance evidently should be based upon crossing tests rather than upon the appearance of the parent lines.

Cytological studies of some Indian oleiferous Cruciferae, III, Z. ALAM (*Ann. Bot. [London], 50 (1936), No. 197, pp. 85–102, pl. 1*).—The somatic chromosome numbers were ascertained, and corroborated by meiotic counts except for the last, in *Eruca sativa, Brassica trilocularis, B. campestris dichotoma, B. campestris toria,* and *B. juncea*. Their morphology, size, and the relation of length to number were also studied, and the various steps in meiosis followed.

It is concluded that the phylogeny of the Cruciferae has apparently involved cases of fusion, fragmentation, reduplication, and other structural changes besides polyploidy and change in balance.

Polyploidy and susceptibility to frost [trans. title], L. A. SCHLÖSSER (*Züchter, 8 (1936), No. 3, pp. 75–80, fig. 1*).—Work with *Lycopersicum racemi-*

gerum, L. cerasiforme, and winter rape indicated that in autopolyploid series there is an increase in frost susceptibility as the chromosomes increase in number. Cryoscopic determinations showed a correlation between frost susceptibility and decreasing osmotic values in the higher chromosome groups. There was a definite correlation between increasing cell size and decreasing osmotic value. The author believes that plant breeders should use osmotic value determinations in estimating the value of autopolyploids.

Factor interaction in Citrullus, J. W. McKay (*Jour. Heredity, 27 (1936), No. 3, pp. 110–112*).—In crosses at the University of California between watermelons having tan and green seed coat colors and those of red seed coat color, monohybrid ratios were observed in the F_2 in each case, with the red color recessive. The author suggests that tan and green seed coats are probably determined by two independent factors, both dominant over red in the F_1, the latter color being an expression of the double recessive condition.

Aposporic parthenogenesis in a triploid apple, Malus hupehensis, H. Dermen (*Jour. Arnold Arboretum, 17 (1936), No. 2, pp. 90–105, pls. 3*).—In *M. hupehensis,* a triploid species with 3n=51 chromosomes, sexuality is suppressed completely through the degeneration of the sexual cells in both anthers and ovules. Propagation is accomplished by parthenogenesis. Embryo sacs are probably formed entirely by apospory in which normal egg apparatus are developed. Polyembryony was found linked with the development of complex embryo sacs. The author believes that *M. hupehensis* is of hybrid origin but must from a taxonomic standpoint be considered as a very stable species, since only very rarely is there a failure to breed true from seed.

Fertilization in the Baldwin apple, a triploid variety, H. Dermen (*Jour. Arnold Arboretum, 17 (1936), No. 2, pp. 106–108*).—Studies at the Arnold Arboretum of the root tip cells in 136 Baldwin apple seedlings obtained from open-pollinated fruits showed somatic chromosomes ranging from 35 to 51 in 130 cases and 1 each with 53, 57, 58, 59, 62, and 65 chromosomes. The fact that the 41 class was not the largest single group but conformed rather closely to the expectation on the basis of a normal distribution is held to invalidate Moffett's theory that a 17+7 chromosomal combination is more viable than others. Had the seeds resulted from self-pollination or from crosses with other triploids the class centers would have been around 51. The results suggest that the Baldwin apple crosses easily with diploids. On the basis of 3n×3n cross with the union of gametes with 25 ± chromosomes, seeds with chromosomes ranging around 51 should have been numerous.

The relation between cell, nuclear, and chromosome dimensions in a sterile violet species-hybrid, W. P. Pierce (*Bul. Torrey Bot. Club, 63 (1936), No. 3, pp. 115–138, pl. 1, figs. 3*).—This is a contribution from the Vermont Experiment Station.

Notes on the chromosome number and morphology in root tips of tung (Aleurites fordii, Hemsl.), E. A. Graner (*Arch. Inst. Biol. Veg. [Brazil], 2 (1935), No. 1, pp. 81, 82, pl. 1*).—The somatic chromosomes were studied in the metaphase stages of mitosis in rapidly growing root tips and from satisfactory counts in approximately 20 equatorial plates the somatic number was found to be 22. The text and figures show their morphology and arrangement.

The inheritance of productivity in farm live stock, I–V (*Empire Jour. Expt. Agr., 3 (1935), No. 9, pp. 1–30, pls. 6, figs. 3*).—The following papers were presented before the zoology section of the British Association for the Advancement of Science at Aberdeen, in 1934.

1. *Meat,* J. Hammond.—Meat qualities are so dependent on the environment for their expression that improvement must come from selection based on

progeny testing under suitable conditions for the expression of the desired characteristics.

II. *Milk*, A. D. Buchanan Smith.—The importance of analyzing aspects of the lactation curve and their interrelations, together with a better understanding of the nature of genetic factors involved in milk, is emphasized.

III. *Breeding for egg-production*, A. W. Greenwood.—Difficulties in differentiating between birds heterozygous and homozygous for egg-production characters complicate progress. Account must be taken of the role of environment and the relationship of the pituitary secretions to the reproductive process.

IV. *Wool*, J. E. Nichols.—Proper environment must be provided to permit the expression of characters before a satisfactory basis for selection is available.

V. *Discussion of preceding contributions*, J. L. Lush.—Summarizing the above papers, the complex nature of inheritance is pointed out. Selection must be practiced in suitable environment for the expression of specific characteristics. Emphasis is placed on selection for gene combinations rather than for individual genes.

Inheritance of susceptibility to tuberculosis in cattle [trans. title], C. Ehrlich (*Zuchtungskunde, 10 (1935), No. 1, pp. 1–10*).—Familial incidence of tuberculosis running through two, three, or four generations of black-pied Lowland cattle is cited as evidence of the inheritance of susceptibility to tuberculosis. Confirmation of this conclusion was obtained from another herd as well.

Genetic history of the Holstein-Friesian cattle in the United States, J. L. Lush, J. C. Holbert, and O. S. Willham (*Jour. Heredity, 27 (1936), No. 2, pp. 61–71, fig. 1*).—A pedigree analysis of Holstein-Friesian cattle was made at the Iowa Experiment Station according to the sampling methods of Wright (E. S. R., 54, p. 324). The coefficient of inbreeding increased from 0 to over 4 percent in approximately 10 generations from 1889 to 1931, and the inter se relationship increased to 3.4 percent during the same period. The influence of De Kol 2nd as an ancestor of most of the animals in the breed is noted. High producers and outstanding show specimens differed little from the breed average in inbreeding but showed a higher relationship to a few recent ancestors.

Flexed-tailed Peromyscus, R. R. Huestis and E. Barto (*Jour. Heredity, 27 (1936), No. 2, pp. 73–75, figs. 2*).—An inherited shortening and distortion of the caudal vertebrae with fusion of certain joints is described in *Peromyscus*. The character, while variable, graded into the normal. It was considered due to two sets of recessive genes which were evidently independent of those for brown coat color.

The establishment of the "A" strain of inbred mice, L. C. Strong (*Jour. Heredity, 27 (1936), No. 1, pp. 21–24, fig. 1*).—The breeding of two lines of mice by inbreeding, largely through brother-sister matings of litter mates with selection for high and low incidence of spontaneous mammary carcinoma, is described. Every female in one line for 19 generations developed spontaneous carcinoma of the mammary gland, although no cases occurred in the other line except in the female from which the strain originated.

Curly$_2$, a recent dominant mutation in the Norway rat, P. W. Gregory and C. T. Bluhn (*Jour. Heredity, 27 (1936), No. 1, pp. 38–40, fig. 1*).—The authors, from the California Experiment Station, described the occurrence of a second gene for a curly type of hair. The first, indistinguishable in phenotypic characteristics, was described by King (E. S. R., 68, p. 747). The gene is autosomal and dominant to the normal.

A note on the dominant white and crest in poultry, A. E. Brandt (*Jour. Heredity, 27 (1936), No. 2, pp. 79–82, figs. 2*).—Attention is called to the appearance of spots on the second chick feathers of birds heterozygous for dominant

white at least in crosses with birds of wild color types. However, the homozygotes did not show the colored spots. It was pointed out that homozygous crested, homozygous noncrested, and heterozygous birds could be distinguished at hatching by the presence of a cranial hernia in the homozygous crested birds which was lacking in the heterozygotes and noncrested birds. The latter two types could be separated by the attachment of the comb, which was shortened in the heterozygous crested birds.

[Zootechnical problems in experimental endocrinology], II, edited by B. M. ZAVADOVSKIĬ (*Moskva: Vsesoûzn. Akad. Selsk. Khoz. Lenina, 1935, vol. 2, pp. 422+[2], figs. 66).*—The following papers on endocrinology with English and German abstracts deal especially with the physiology of reproduction in domestic animals and the diagnosis of pregnancy:

The Main Problems and Achievements of Zootechnical Physiology in U. S. S. R., by B. M. Zavadovskiĭ (Zawadovsky) (pp. 5–27); The Hormonal Method for Detection of Pregnancy in Cows, by E. V. Zavadovskaĭa (Zawadovskaya) and S. M. Shtamler (Stammler) (pp. 28–47); The Hormonal Method for Detection of Pregnancy in Swine, by S. E. Faermark (Fajermark) (pp. 48–58); Experimental Application of the Hormonal Methods for Diagnosing Early Pregnancy in Domestic Animals, by E. I. Kazarnovskaĭa (Kasarnovskaya) and O. K. Vakusevich (Vakussevich) (pp. 59–70); On the Question of the Origin of the Sex Hormone in the Urine of Pregnant Sows, by S. E. Faermark (Fajermark) (pp. 71–77); Regulation of Oestrus and Ovulation in Sows by Means of Endocrine Preparations, by S. E. Faermark (Fajermark) (pp. 78–97); The Influence of Gonad Stimulants on the Organs of Swine [trans. title], by B. P. Khvatov (Chwatoff), M. R. Bogdanovoĭ (Bogdanowa), and N. N. Kuznetšova (Kuznezoff) co-working) (pp. 98–127); Reproduction in Silver Foxes under the Influence of Sex Stimulators, by E. A. Kakushkina (pp. 128–143); The Comparative Physiological Activity of Different Gonado Stimulators, by M. B. Goldberg (pp. 144–173); Preservation of a Highly Active Preparation of the Prolan Hormones of the Urine of Pregnant Women and the Prolans of the Urine of a Woman with Genital Carcinoma [trans. title], by E. I. Estrin (pp. 174–182); The Problem of the Standardization of the Male Sex Hormone, by B. P. Khvatov (Chvatov) (pp. 183–185); The Content of Hormones of the Sex Cycles in Pregnant Mares' Urine and Serum, by S. M. Shtamler (Stammler) (pp. 186–220); The Effect of Aqueous and Alcohol Solutions of Ovariolysates on Egg Production, by V. Unik and Sh. Volkovyskaĭa (Volkovyskaya) (pp. 221–228); On the Problem of Stimulating Laying Ability in Hens Maintained in Battery Conditions, by L. Lipchina and N. Palmova (pp. 229–235); The Influence of Aqueous and Oil Solutions of Folliculin on the Sexual System in Pullets, by N. Raspopova (pp. 236–243); On the Problem of the Influence of Prolan, Pituitary Gland and Extracts of Placenta on the Ovaries and Oviducts of Hens, by L. Lipchina (pp. 244–250); The Influence of Prolan on the Sexual System and Metamorphosis in Axolotls, by L. Lipchina (pp. 251–260); The Influence of Anterior Pituitary Hormones upon Lactation in Cows, by G. Azimov (Asimof), V. Pchelina, N. Pariĭskaĭa (Pariskaya), and B. Khvatov Chvatow) (pp. 261–273); The Influence of Hormones and Lysats on Lactation, by L. Lipchina (pp. 274–282); Hyperinsulinization of Pigs Fattened on Garbage, by V. G. Boĭchenko and V. A. Obydennov (Obidennof) (pp. 283–310); The Influence of Insulin on the Alteration of Liveweight in Hens and Pullets, by M. F. Ûdina (pp. 311–320); Hyperthyroidization in Hens, in Relation to Nutritive Rations, by K. K. Pakhmurin (Pachmurin), M. P. Rylovnikov (Rilovnikoff), and P. G. Volobuev (Wolobuiev) (pp. 321–327); Contributions to the Problem of Experimental Moulting of Geese, by M. P. Rylovnikov (Rilovnikoff) (pp.

328–330); A Test of the Hyperthyroidization Method for the Purpose of Facilitating Plucking of Feathers and Down from Slaughtered Geese, by B. M. Zavadovskiĭ (Zawadovsky), P. P. Galkin, V. A. Bogdanova, and N. D. Arzamastseva (Arzamaszeva) (pp. 331–342); Thyreotropic Hormone and Metamorphosis in Axolotls, by M. ÎA Solovei (pp. 343–352); The Comparative Activity of Thyroxin and Thyroidin, by E. V. Zavadovskaîa (Zawadovskaya) (pp. 353–358); The Influence of Pharmacological Products on the Metamorphosis in Axolotl, by P. A. Korzhuev (Korjuieff) (pp. 359–372); The Production of Binuclear Liver Cells (The Influence of the Prolans on the Liver of Immature Mice) [trans. title], by B. P. Khvatov (Chwatow) and M. ÎA Solovei (Solowej) (pp. 373–382); The Hormones of Corpus Luteum [trans. title], by L. Lipchina (pp. 383–393); The Endocrine Factors of Sexual Life in Fowls [trans. title], by B. M. Zavadovskiĭ (Zawadovsky) (pp. 394–409); and To the Comparative Experimental Endocrinology of Menstrual Cycle and Oestrus [trans. title], by B. M. Zavadovskiĭ (Zawadovsky) (pp. 410–422).

Observations on the gestation period of the rabbit, P. D. Rosahn, H. S. N. Greene, and Ch'uan-k'uei Hu (*Jour. Expt. Zool., 72 (1935), No. 1, pp. 195–212, fig. 1*).—Data are presented on the duration of gestation of 1,257 pregnancies of 716 does of 11 breeds and hybrids. The gestation periods resulting in the production of viable young ranged in duration from 29.1 to 33.6 days, with an average of 31.34±0.032 days. The data were analyzed with reference to breed, season of the year, weight of does, size of litter, parentage, and other conditions. In some instances, it appeared that the male parent significantly influenced the duration of the gestation period.

Does the right ovary of the bovine function more frequently than the left? C. F. Clark (*Jour. Amer. Vet. Med. Assoc., 88 (1936), No. 1, pp. 62–65*).—In studies at the Michigan Experiment Station observation was made on 704 cases of single pregnancies in cattle of different breeds. Of these, 293 or 42 percent of the fetuses were in the left cornu of the uterus, whereas 411 or 58 percent were in the right cornu. The sexes were about equally distributed in the fetuses in both sides of the uterus.

Preliminary studies on the preservation of the semen of the stallion, A. C. Gonzaga and A. Valenzuela (*Philippine Jour. Anim. Indus., 1 (1934), No. 6, pp. 371–377*).—Several media and temperatures were tested for preserving the motility of the spermatozoa of semen normally ejaculated and of semen removed from the epididymis of castrated stallions. The longest period over which motility was maintained in ejaculated semen was 96 hr. in a glucose-peptone-tartrate solution with the pH of 7.2 and a temperature of from 0° to 2° C. On the other hand, motility was maintained at from 0° to 2° in semen from the epididymis of castrated stallions for from 17 to 18 days.

Artificial insemination in fowls, J. P. Quinn and W. H. Burrows (*Jour. Heredity, 27 (1936), No. 1, pp. 31–37, figs. 2*).—By a new method of artificial insemination of poultry, it was possible, in studies in the U. S. D. A. Bureau of Animal Industry, to obtain 97 percent fertility between fowls differing so greatly in size and weight that only 4 percent fertility was obtained in natural matings. The new method involves a careful exposure of the oviduct of the female with the injection of the semen directly into the uterus by the aid of a tuberculin syringe, with the needle removed. Several types of crosses were made successfully, and a high rate of fertility was maintained by inseminating females five days each week.

Reproductive hormone therapy in domestic animals, G. H. Hart and H. H. Cole (*Jour. Amer. Vet. Med. Assoc., 88 (1936), No. 1, pp. 12–23*).—A brief statement of the role of the hormones involved in reproduction, including different names applied to the same hormone.

Oestrogenic hormone and the mechanism of corpus luteum formation in the rabbit, C. BACKMAN (*Soc. Expt. Biol. and Med. Proc., 33 (1936), No. 4, pp. 551–554*).—Injections of large single doses of crystalline oestrone in corn oil into 12 rabbits at McGill University did not cause involution of the ovarian granulosa of the adult oestric rabbit, did not inhibit ovulation and corpora lutea formation in the post-coital rabbit, and had no effect on pituitary weight, although it possibly altered the anatomical pattern in the progestational mucosa of the uterus.

Development of female characteristics in adult male rabbits following prolonged administration of estrogenic substance, C. N. FRAZIER and J. W. MU (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 7, pp. 997–1001, figs. 6*).—In studying the influence of prolonged administration of oestrogenic substance to male albino rabbits, 24 rats 16 to 17 mo. of age were employed for the administration of doses of extracts of acidulated human pregnancy urine over varying periods.

The results showed that there was a distinct feminization resulting from the long-continued administration. The mammary system developed, and milk could be expressed from the nipples. The lactating males willingly fostered young rabbits and suckled them. The testes became atrophic and were held at the inguinal ring. The penis was shrunken and the skin under the neck loosened as in females. Habits and behavior were female in character.

Prepuberal development of the pig ovary and its relation to stimulation with gonadotropic hormones, L. E. CASIDA (*Anat. Rec., 61 (1935), No. 4, pp. 389–396*).—The histology of the ovaries of 16 sows, ranging from 1 to 112 days in age and 2 to 96 lb. in weight, is described. Primary follicles predominated between the fourth and seventh weeks of age, but vesicular follicles were not found in abundance until about 15 to 16 weeks of age. The administration of horse pituitary powder and acetone extract of pregnant mare serum before vesicular follicle formation occurred did not bring about any response. The follicles of a size comparable to mature follicles in adult animals were more easily ovulated than larger ones.

Sex comparison of gonadotropic content of anterior hypophyses from rats before and after puberty, M. MCQUEEN-WILLIAMS (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 7, pp. 1051, 1052*).—Study was made of the gonadotropic hormone present in the anterior hypophysis of rats of different ages, ranging from 18 days to 4 mo., through transplantation intramuscularly of the hypophysis of animals of different ages at the California Experiment Station.

The results indicate that the male pituitary reaches its highest potency at from 28 to 31 days of age, and that females 18 to 28 days of age are equivalent to the highest potency reached by males. After the prepubertal drop the female pituitary steadily declines in its capacity to induce large ovaries in immature recipients, but the male regains most of its potency.

Gonadotropic effects in hypophysectomized female rats of implants of pituitaries from castrated males, H. M. EVANS, M. E. SIMPSON, and R. I. PENCHARZ (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 7, pp. 1048, 1049*).—Hypophyses of castrated male rats were implanted into hypophysectomized females at 26 days of age. This led to the production of follicles and to the appearance of corpora lutea with larger doses.

Age and the qualitative ovarian response of the immature rat to mare gonadotropic hormone, F. J. SAUNDERS and H. H. COLE (*Soc. Expt. Biol. and Med. Proc., 33 (1936), No. 4, pp. 504, 505*).—Rats 15, 18, 19, 21, and 25 days of age were injected with 2, 16, and 500 rat units of mare gonadotropic hormone

with necropsy 120 hr. after injection, in studies at the California Experiment Station, for a determination of the influence of age and dosage of the hormone on ovarian and uterine growth, follicular development, ovulation, and the formation of corpora lutea. The differences in the response observed in animals of different ages emphasized the importance of knowing the stage of sexual development of rats used for these tests.

Augmentation of ovary-stimulating action of gonadotropic preparations, A. A. HELLBAUM (*Soc. Expt. Biol. and Med. Proc., 33 (1936), No. 4, pp. 568–570*).—In studies of the influence of various materials in augmenting the action of anterior pituitary hormones from sheep and horses on ovarian growth in 21- to 22-day-old rats, marked responses were obtained from a preparation of male urine. This preparation failed to augment the action of the follicle-stimulating and luteinizing fractions administered separately, but when combined increases in the weights of the ovaries were obtained.

The action of human pregnancy urine and serum of pregnant mares was not augmented with male urine.

All of the products tested, which included extracts of milk, eggs, liver, thyroid, and lemons, augmented the action of the unfractionated pituitary. Active preparations of the male urine "are soluble in water, dilute acids and bases, low concentrations of acetone and alcohol, and are precipitated by tannic acid and by high concentrations of alcohol or acetone . . . stable to boiling . . . not effective when given orally."

Means of augmenting the ovarian response to gonadotropic substances, F. J. SAUNDERS and H. H. COLE (*Soc. Expt. Biol. and Med. Proc., 33 (1936), No. 4, pp. 505–508*).—The addition of several substances to the pituitary synergist (E. S. R., 73, p. 27), in studies at the California Experiment Station, was found to augment the action as determined by the weight of the ovaries of immature rats after three daily injections. Zinc sulfate caused a threefold increase as compared with the synergist alone, and some increase in ovarian weight was obtained when egg albumen and casein were administered with the synergist. It was considered that the substances delayed absorption of the active principle and thus increased ovarian growth followed.

Relative gonadotropic augmentive action of plasma and formed elements from blood of cattle, L. E. CASIDA (*Soc. Expt. Biol. and Med. Proc., 33 (1936), No. 4, pp. 570–572*).—Studies of the augmentation by blood of the action of anterior pituitary extracts on the weight of the ovaries of immature rats, at the Wisconsin Experiment Station, showed that the augmentative power of the materials thrown down by a centrifuge was much greater than for the plasma, which showed little if any augmentation. As incineration destroyed the augmenting substance, it is considered to be organic.

Reactions of mammary glands of normal and hypophysectomized male guinea pigs to female sex hormone, W. R. LYONS and R. I. PENCHARZ (*Soc. Expt. Biol. and Med. Proc., 33 (1936), No. 4, pp. 589–592, figs. 4*).—Studies were made at the California Experiment Station of the effect on mammary development of oestrin administration to normal and hypophysectomized male guinea pigs. The nipples of both groups showed about equal development, but lactation occurred only in the normal animals. It seems evident that the pituitary is necessary for functional growth of the mammary gland.

The bill of the sparrow as an indicator for the male sex hormone.—I, Sensitivity, E. WITSCHI (*Soc. Expt. Biol. and Med. Proc., 33 (1936), No. 4, pp. 484–486*).—In studies at the University of Iowa of the pigmentation of the bill of the male and female castrated sparrow as an indicator of the male sex hormone it was found that the reaction appeared in all groups tested, including

birds in the quiescent period. However, the bill of the female was slower to respond than the male bill.

One sparrow unit (SU) was calculated as equivalent to 0.1, or even less than a rat unit, and approximately 0.5 of a Chicago capon unit of the male sex hormone.

Inability of testicular hormone to masculinize plumage and eye-color of female Brewer's blackbird, C. H. DANFORTH and J. K. FISHER (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 7, pp. 1115–1117*).—In three experiments negative results were obtained from the influence of beef testis extracts on the masculinization of plumage and eye color of female Brewer's blackbirds. The failure to obtain response is attributed to the inability of the species to absorb the extract or to the differentiation of sexual differences in plumage and eye color due to factors other than the primary sex hormones.

Effect of pregnant mare's serum on the immature fowl, V. S. ASMUNDSON and M. J. WOLFE (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 7, pp. 1107–1109*).—Studies of the influence of pregnant mare's serum on sexual maturity in fowls at the California Experiment Station demonstrated that the serum induced precocious sexual development in immature male and female White Leghorns by stimulating the size of the testis and the size of the ovary.

Although the evidence was incomplete, spermatogenesis and ovulation were probably induced in the immature birds.

A sensitive biological test for menopause or castration prolan, H. M. EVANS and M. E. SIMPSON (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 7, p 1048*).—A combination of an extract of pregnancy prolan and menopause urine, each of which alone produced ovaries in immature rats weighing less than 30 mg, produced ovaries averaging 150 mg in weight. Emphasis is placed on the synergic reaction.

Production of superovulation in normal immature rats by injection of the principle in menopause urine, H. M. EVANS and M. E. SIMPSON (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 7, pp. 1046, 1047*).—Studies of extracts of menopause urine showed that they not infrequently contained a hormone or hormones capable of causing luteinization or superovulation in the normal immature rat.

Synergism or augmentation produced by the addition of an hypophyseal synergist to menopause or castration urine, H. M. EVANS and M. E. SIMPSON (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 7, p. 1047*).—Continuing the above studies, combinations of menopause urine with an hypophyseal fraction produced abundant corpora lutea and moderately large ovaries averaging from 50 to 150 mg in weight in test animals.

Intravaginal assay of urinary estrin, W. R. LYONS and H. J. TEMPLETON (*Soc. Expt. Biol. and Med. Proc., 33 (1936), No. 4, pp. 587–589*).—Tests in inducing oestrum in ovariectomized rats, at the California Experiment Station, showed that more positive results could be obtained, as indicated by cornified epithelium with smaller doses applied directly to the vaginal epithelium, than was possible with subcutaneous injections.

The action of folliculin benzoate on the plumage of the domestic fowl [trans. title], F. CARIDROIT (*Compt. Rend. Soc. Biol. [Paris], 118 (1935), No. 6, pp. 523–526*).—Complete feminization of the plumage of Leghorn and Indian game hybrids was produced by the administration of 1 mg of folliculin benzoate two or three times per week. A condition similar to that produced by ovarian grafts and differences in the threshold in response of feathers located on various regions of the body were noted. Changes in the plumage character appeared after 32 days from the initial injection.

Comparison of the action of ovarian grafts to the action of folliculin benzoate on the comb and spurs of capons [trans. title], F. CARIDROIT (*Compt. Rend. Soc. Biol. [Paris], 118 (1935), No. 7, pp. 627–629*).—Folliculin was considered to represent only a part of the ovarian secretion, since 10 daily doses of 1 mg of folliculin benzoate had no effect on comb development.

Parabiotic twins as a means of determining cellular individuality, M. R. IRWIN and R. T. HILL (*Soc. Expt. Biol. and Med. Proc., 33 (1936), No. 4, pp. 566–568*).—Reciprocal agglutination tests of serum reactions of parabiotic twins, which were the back-cross progeny of Ring doves mated to hybrids of the Pearlneck and Ring doves at the Wisconsin Experiment Station, are reported. The results indicate that each member of a pair of parabiotic twins develops antibodies against the red cells of the other member of the pair.

FIELD CROPS

[Agronomic work in Connecticut] (*Connecticut [New Haven] Sta. Bul. 381 (1936), pp. 169, 190, 192–194, 196*).—Progress is reported briefly from fertilizer tests with potatoes and sweetpotatoes and from work at the Tobacco Substation including germination studies with tobacco seed, comparisons of nitrogen carriers to replace cottonseed meal, the seasonal soil nitrate production by different nitrogen carriers, a better strain of shade tobacco, and the further development of the seed and soil testing service for tobacco growers. Features of a new system for appraising values of mixed seed are indicated.

[Field crops work in Hawaii] (*Hawaii Sta. Rpt. 1935, pp. 7–9, 10, 11, 12, 26, 27*).—Research for which progress results are reported briefly included breeding work with pigeonpeas; variety tests with soybeans for seed, forage, and green vegetable use, potatoes, sweetpotatoes, and peanuts; adaptation studies with numerous forage grasses and legumes; studies of seedling strains of *Pennisetum purpureum;* cutting experiments with alfalfa and Napier grass; response of pasture to fertilizers and cultivation; a fertilizer test with rice; and the production of disease-free seedstocks of Triumph potatoes.

[Field crops experiments in Maine] (*Maine Sta. Bul. 380 (1935), pp. 147–161, 172–178, 185–187, 218, 219*).—Among continued experiments with potatoes (E. S. R., 73, p. 463), largely at Aroostook Farm, on which progress is reported again were fertilizer experiments, largely in cooperation with the U. S. Department of Agriculture, and including placement and rate of application tests, variations in the potassium and magnesium in the formula, a comparison of acid v. neutral fertilizers, and tests of uncommon elements, all by J. A. Chucka, D. B. Lovejoy, and B. E. Brown; spraying and dusting studies, by R. Bonde, concerned with the value of spraying in the absence of late blight, dusting v. spraying, bordeaux mixture v. basic copper sulfate, other comparisons of different spray fungicides, effect of spraying potatoes during hot and bright sunny weather, comparison of different spray schedules, yield comparisons with dolomitic hydrated lime v. high-calcium hydrated lime in the preparation of bordeaux mixture, yield of potatoes dug at different dates following different fungicidal treatments, and spray service; other activities by Bonde, including yield comparison between Green Mountain and Rust Proof potatoes, killing of potato vines with sulfuric acid to hasten maturity, tuber cracking in Green Mountain potatoes, and distribution of new seedling varieties; and a study of cooking quality of potatoes, by M. D. Sweetman. Improvement of permanent pastures and timothy meadows by fertilization, by D. S. Fink; and experiments on the control of sweetfern, laurel, alder, and bracken fern in blueberry fields and the use of sulfuric acid and sodium chlorate as herbicides, by F. B. Chandler and I. C. Mason are also reported on.

[Field crops experiments at the South Mississippi Substation, 1932–35], J. C. ROBERT and S. R. GREER (*Mississippi Sta. Bul. 310 (1935), pp. 3–12, figs. 9*).—Progress results (E. S. R., 67, p. 29) are reported briefly from variety tests with sugarcane (in cooperation with the U. S. Department of Agriculture), summer and winter legumes for soil improvement, cotton, and corn; a comparison of commerical fertilizer and stable manure for cotton; corn grown in rotation with different legumes; comparative production trials of hemp, flax, ramie, and cotton for fiber; and a trial of crops for hogging.

[Crop production in Nebraska] (*Nebr. State Bd. Agr. Ann. Rpt., 1935, pp. 124–147, 153–174, 190–220, 571–575, figs. 33*).—Papers of interest to agronomists included The Most Profitable Use of Land as Shown by Nebraska Farm Records, by A. G. George (pp. 124–132); Nebraska Land Utilization Studies, by A. Anderson (pp. 133–147); Three Trends to Be Considered in Relation to a Land Use Program, by O. E. Baker (pp. 153–174); Value of Terracing, Contour Farming, Strip Farming, and Other Practices in Conserving Precipitation, by I. D. Wood (pp. 190–199); Making the Most of Rainfall Through Soil and Crop Management, by J. C. Russel (pp. 199–206); The Geographic Distribution of Bindweed, by P. H. Stewart (pp. 206–209); Mechanical Methods for Bindweed Eradication, by C. W. Smith (pp. 209–216); Needed Legislation on Bindweed, by W. Magee (pp. 216–220); and Silage Crops, by P. H. Stewart (pp. 571–575).

[Field crops research in Ohio] (*Ohio Sta. Bul. 561 (1936), pp. 17–20, 23–34, 61–63, 101, 102, 103, 104–106, figs. 2*).—Agronomic investigations (E. S. R., 73, p. 463) from which progress results are reported were concerned with the effects of soil reaction upon growth of alfalfa and red clover and benefits resulting from their successful production upon the yields of cereals in the rotation, by R. M. Salter; the effects of various cropping systems on crop yields, by L. E. Thatcher; effects of applying fertilizers directly to soybeans, by E. E. Barnes; corn hybrid and variety experiments, by G. H. Stringfield; determination of the accumulation of mineral elements in Krug corn top crosses, by J. D. Sayre and V. H. Morris; root characteristics of wheats in relation to winter injury, by C. A. Lamb; the crude protein content of soybean hay from different varieties, by J. B. Park and Thatcher; the value of viscosity tests in selecting new wheats, by E. G. Bayfield; comparative trials of new early sweet corn hybrids, by Park; factors causing fluctuations in the white clover content of permanent pastures, by D. R. Dodd; a sodium chlorate-limestone mixture for killing noxious weeds, by C. J. Willard; the response of turf to artificial watering, by F. A. Welton; a new rotation for potatoes, the possibility of producing Irish Cobbler seed potatoes, and the new Warba potato, all by J. Bushnell; methods of securing alfalfa stands, by M. A. Bachtell and H. S. Elliot; response of pastures to clipping, by Batchell and L. W. Sherman; variety tests with wheat on the Miami County Experiment Farm, by Lamb and P. A. Jones; alfalfa-timothy mixtures v. nitrogen-treated timothy, by Bachtell and H. Allen; response of meadows to soil improvement, by Bachtell and R. Hopkins; the beneficial effect of keeping heavy soils in grass, by Bachtell and L. A. Malik; the cumulative effect of weather conditions on pastures, by Bachtell and E. McCall; and tobacco rotations, by Bachtell and H. M. Wachter. Certain lines of work were in cooperation with the U. S. Department of Agriculture.

Causes of winter-killing of crops under northern conditions [trans. title], M. T. TIMOFEEVA (*Trudy Prikl. Bot., Genet., i Selek. (Bul. Appl. Bot., Genet., and Plant Breeding), 3. ser., No. 6 (1935), pp. 59–95, figs. 8; Eng. abs., Sum. [Sect.], pp. 4–7; abs. in Ann. Agron. [Paris], n. ser., 6 (1936), No. 1, pp. 148, 149*).—Studying the time and causes of winter-killing of wheat and rye in

the greenhouse and in the field, the author found that an environmental factor unfavorable to wintering of these crops is oversaturation of the upper soil layers with water in autumn and spring, particularly when water accumulates at the surface and an ice sheet is formed. Such conditions prevent hardening of the plants in autumn, making them less resistant in winter and spring. Late planting is another unfavorable condition for wintering of crops. This is due to weak development of the plants, less vigor, and insufficient hardening. Hardening of plants, which is a powerful factor in their resistance to unfavorable winter conditions, varies greatly with the stage of development of the plant when it enters the winter period. "In choosing the date of sowing for winter cereals, the varietal peculiarities of a plant should be taken into consideration as well as the interrelation between plant and environment. In regions subjected to flooding and frost killing of plants, the date of sowing must be sufficiently early so that the plant may have time to become firmly rooted, well tillered, and sufficiently hardened . . . before winter has set in."

Grain and forage sorghum varieties at the North Platte Experimental Substation, L. L. ZOOK (*Nebraska Sta. Bul. 297 (1936), pp. 12, figs. 2*).—Results obtained with grain sorghum and sorgo varieties on dry land at the North Platte Substation during the period 1921–35 in comparisons between yields of grain sorghums and corn, and in their response to seasonal conditions and differences in their effects upon succeeding crops, are reported with data from 2 yr. of preliminary trials of Atlas sorgo and corn under irrigation for silage. Each variety is described briefly and its merits are discussed. Early Kalo, a grain sorghum, and Atlas sorgo have been especially promising in recent years.

Differences between grain sorghums and corn in growth habits, heat requirements, and heat and drought endurance were shown to result in differences in their response to varying seasonal conditions. In the varietal tests, corn yields in 1924 and 1928 more than doubled grain-sorghum yields, while in 1932 and 1935 much higher yields were made by grain sorghums than by corn. When Dwarf Yellow milo and corn were grown in four crop rotations under favorable conditions, 1921–34, the milo made the higher yield seven times, in amounts ranging from 0.2 to 18.5 bu. per acre, while corn excelled six times in amounts measuring from 0.1 to 15.8 bu. In the dry land rotations average yields of all crops following corn exceeded those after small grains, except where rigid after-harvest weed control was practiced on the latter. Grain sorghums did not show a like beneficial effect on succeeding crops.

Corn was injured permanently by burning between irrigations in the hot, dry season of 1934, whereas Atlas sorgo was affected much less severely, the silage yields averaging 5.9 and 15.2 tons per acre, respectively. In 1935 with more nearly normal temperature conditions, corn responded about as usual to irrigation, while Atlas made less growth than in 1934, the average silage yields being Atlas 11.3 tons and corn 14 tons per acre.

Pasture investigations.—VII, Species and varieties of grasses and legumes for pastures, B. A. BROWN and R. I. MUNSELL ([*Connecticut*] *Storrs Sta. Bul. 208 (1936), pp. 33*).—Experiments, 1930–35, involving about 150 species, varieties, and mixtures of pasture plants in tests for longevity, total and seasonal production, and sometimes for palatability and chemical composition, are reported in the seventh of this series (E. S. R., 75, p. 39). Yields of air-dry matter usually were determined by mowing two or three times per season, first in early June and last about September 1.

The few species which maintained good stands 3 yr. or longer under either cutting or grazing included Kentucky bluegrass, the bents (including redtop),

orchard grass, timothy, reed canary grass, and sheep's and Chewing's fescues, and Ladino clover and wild white clover in mixtures and Grimm alfalfa alone. The fescues were very unpalatable and reed canary grass was rather low in nutritive value and in yields on well-drained soils. Perennial rye, meadow fescue, smooth brome, and tall oatgrasses, listed in order of increasing longevity in these tests, did not maintain good stands either alone or in mixtures. Red and alsike clovers, sweetclover, and birdsfoot trefoil produced well until midsummer of the second year after seeding.

An early strain of Korean lespedeza yielded poorly, especially on soil deficient in phosphorus, and was only slightly less sensitive than alsike to soil acidity. Lespedeza was not aggressive enough to occupy much of the area when sown in mixtures of common grasses and legumes or on a surface of run-out pasture soils with thin turfs. Reed canary grass and the bents yielded relatively better than other grasses on acid, phosphorus-deficient soils, and perennial rye and bromegrasses also were fairly productive where the soil contained little easily soluble phosphorus. Meadow fescue, Kentucky bluegrass, timothy, and orchard grass, and red, white, and alsike clovers had poor stands where a depleted soil with a pH of 5.2 was not limed. Most species responded markedly to potash where the soil had been impoverished by prolonged mowing for hay.

The simple mixtures (one grass and one legume) yielded as well or better for 3 yr. than those containing several species. Seasonal production was not influenced appreciably by including early, late, or both kinds of grasses in seed mixtures, but legumes were very effective in increasing the proportions of the total productions available in late summer. Ladino clover seeded with a grass was outstanding in both total and late summer yields. Seeded alone under suitable soil conditions, alfalfa outyielded all species and maintained a fair stand through 4 yr. of controlled grazing. Sweetclover or red clover seeded with one grass yielded very well for 2 yr.

Animals preferred bromegrass, timothy, and meadow foxtail and avoided sheep's and Chewing's fescues. Other grasses were intermediate in palatability. Red, white, and alsike clovers were grazed in preference to all grasses. Sudan grass, of the summer annuals, was slightly superior to Japanese millet when grazed by cows, both providing considerably more pasturage than soybeans.

Rhode Island bent yielded over 20 percent more than Kentucky bluegrass during 4 yr. where both were cut with a lawnmower. The total yields of both species rose with increases in the height of these grasses, cut when 2, 3, 4, and 5 in. high, and both had practically the same seasonal distribution of yields.

Several seed mixtures are suggested for pastures.

Alfalfa in Michigan (*Michigan Sta. Circ. 154 (1936), pp. 80, figs. 25*).—Practical information, based extensively on results of research at the Michigan Station and other stations and prepared by many members of the staff, is given on the status of the alfalfa crop in Michigan and the United States; its place in the farm program; its value for hay and pasture, as a cash crop, and for green manure; cultural methods and inoculation and fertilizer practices; harvesting, curing, and storing hay; management of stands; and diseases and insect pests of alfalfa and their control.

Alfalfa seed investigations and other crop varietal studies, Millard County, Utah, 1929 to 1933, inclusive G. WHORNHAM (*Utah Sta. Bul. 268 (1936), pp. 24, figs. 3*).—Research to determine the causes of alfalfa seed failures in Millard County comprised irrigation, cultivation, clipping spacing, and fertilizer experiments; studies of the relation of climate, insects, type and

physical properties of the soil, soil moisture, and alkali concentration to alfalfa seed production; and surveys of seed production on successful farms. The report also includes the results from variety tests with wheat, oats, barley, corn, grain and forage sorghums, and alfalfa for hay.

Factors and practices favoring alfalfa seed production include a rather limited water supply, sufficing for proper functioning of the plant during blooming and seed formation; growing in hills and rows; cultivation only for control of weeds and insects; clipping at early bud stage or pasturing until May 15; and harvesting when about two-thirds of the burs have turned brown but before they blacken. Climate and weather and insects did not seem to be major factors controlling seed production, nor were fertilizers effective. Farms with medium-texture soil have produced seed most consistently. A significant correlation was observed between physical properties of the soil and alfalfa seed yield. A more complete study of soil moisture, water table depth, and alkali concentration, all factors in seed production, seemed needed to determine fully the causes of seed failures, which are attributed to the accumulation of several factors. Solution of the problem also is to be sought in selection and breeding.

Federation wheat, Trebi barley, Markton oats, Gooding Yellow Dent corn, and Red and Black Amber sorgos proved to be the best varieties for the region, and winter-hardy varieties of alfalfa yielded more forage than Millard County common.

Results of bean experiments on the Storrie irrigation project, Las Vegas, N. M., F. GARCIA and S. UTZ (*New Mexico Sta. Bul. 236 (1936), pp. 31, figs. 7*).—In field experiments with several varieties of field beans, 1927–35, yields were found to be influenced by time and rate of planting, amount of moisture in the soil before or after planting for germination, number of irrigations, amount and distribution of rainfall, particularly in July and August, extent of bean beetle infestation, effect of hailstorms, and soil fertility.

Planting June 1 to 7 is advised, although indications were that with enough soil moisture for germination a good crop could be matured when planted as late as June 22. Although five irrigations returned a slightly higher average yield, three irrigations properly spaced during the growing season probably would use water to best advantage. When heavy rains fell in July and August the more frequent irrigations produced larger vines and delayed maturity.

The heaviest seeding rate with pinto beans, about 40 lb. per acre, averaged 95 lb. more crop than the medium rate, 30 lb., which in turn averaged 73 lb. more per acre than the lightest rate, 20 lb. While yields were increased materially by irrigation, the dry farming plats also produced fairly well. The latter plats produced, 1930–33, averages of 597, 566, and 556 lb. per acre, respectively, from the heavy, medium, and light seeding rates.

Dry land plats on which pea vines had been plowed under in 1933 returned 691 lb. per acre in 1935, while the field with no green crops turned under made 432 lb. On irrigated plats with and without green crops turned under, the respective yields were 860 and 693 lb. per acre.

3. Symposium: Applied botanical research on maize (*Contrib. Iowa Corn Res. Inst. [Iowa Sta.], 1 (1935), No. 1, pp. 158, pls. 13, figs. 38*).—In addition to several articles noted elsewhere in this issue, this number contains the following: Applied Botanical Research on Maize, by R. E. Buchanan (pp. 3, 4); Loss Mutations in Maize, by L. J. Stadler (p. 19); Some New Mutants in Maize, by E. W. Lindstrom (pp. 43–51) (E. S. R., 74, p. 471); Chromosome Studies in Black Mexican Maize—I, Behavior of Extra Chromosomes in Black Mexican Inbreds and Hybrids with Dent Types of Maize, by L. M. Humphrey (pp. 141–149) (E. S. R., 74, p. 471); The Future of Corn Production, by H. D. Hughes

(pp. 151, 152); and Six Decades of Corn Improvement and the Future Outlook, by H. A. Wallace (pp. 153–158).

The ontogeny of the maize plant: The early differentiation of stem and root structures and their morphological relationships, J. N. MARTIN and A. L. HERSHEY (*Contrib. Iowa Corn Res. Inst.* [*Iowa Sta.*], *1 (1935), No. 1, pp. 81–95, pl. 1*).—The morphological development of plants of several strains of Reid Yellow Dent corn, Golden King, and a double cross are described, with particular reference to the differentiation of stem structures and the relation of size of the stem to the number of its vascular bundles and to the number and size of its permanent roots, and the average size of the roots to the number and total cross sectional area of their tracheal vessels.

Almost all the structures of the plant, i. e., all the nodes, internodes, leaves and axillary buds, the tassel, at least five whorls of permanent roots, and 90 percent of the vascular bundles in the lower internodes of the stem, were found to be formed during the first 30 to 40 days following planting. In most plants observed, all the structures were differentiated before the thirty-fifth day after planting. The differentiation period was followed by a period of 35 to 40 days in which most structures differentiated during the previous or formative period developed to mature size, and this period was followed by pollination, fertilization, and the maturing of the kernels. The first or formative period surpassed the other two rather distinct periods in the life cycle of the plants in determinative effects on the final achievement of the plants, because during this period nearly all structures upon which the plants' future development depended were established and largely fixed in number and size. During this period the number of nodes, internodes, leaves, and axillary buds were determined by transformation of the tip meristem into the tassel primordium. Ninety percent of the vascular bundles in the first and second internodes above the soil roots and at least five of the seven whorls of roots generally present at maturity were formed during the formative period. The positive correlation of size of the lower internodes and number of their vascular bundles showed that the size of the stems also was largely determined during the formative period. The close positive correlation of size of the stem and number and size of the permanent roots and of size of the roots and their tracheal vessels indicated that these features were largely determined during the first 30 to 40 days and generally before the thirty-fifth day after planting.

The relation of the early determination of structure to production practices and environmental factors is discussed briefly.

Leaf area and growth rate of corn plants, H. F. EISELE (*Contrib. Iowa Corn Res. Inst.* [*Iowa Sta.*], *1 (1935), No. 1, pp. 113–118, figs. 2*).—When corn was thinned to one, three, and five plants per hill, an average plant in the five's contained 30 percent less leaf area by July 1 than one planted singly in the hill. Maximum leaf area was reached much later in thinner planting rates because of the firing of the lower leaves of plants in the thicker rates which began as early as July 15. Rate of planting did not modify significantly plant height. The basal area of stalks in the five's on June 22 was only 60 percent as great as that of plants in the one's. When maximum size was reached the basal area of a stalk from the five's was less than 50 percent as great as that of the one's. The dry weight of all plants per hill in the five's did not exceed that of all the plants per hill in the three's and was only about double that of a single plant in the one's. Every stalk in the one's produced a large ear, and about half of them produced two ears. Not every plant in the three's produced an ear, and ears were formed on less than 75

percent of the plants in the five's. The number of nubbins increased with increased planting rate.

Resistance and susceptibility of corn strains to second brood chinch bugs, J. R. HOLBERT, W. P. FLINT, J. H. BIGGER, and G. H. DUNGAN (*Contrib. Iowa Corn Res Inst. [Iowa Sta.], 1 (1935), No. 1, pp. 5–18, pls. 4, fig. 1*).—The possibility of producing corn hybrids outstanding in yield and quality of grain in years when chinch bugs are not present, and also possessing a high degree of resistance to damage from second brood chinch bug attack (thus being of great value in years of heavy chinch bug outbreaks) is suggested by results secured by the Illinois Experiment Station cooperating with the Illinois State Natural History Survey and the U. S. Department of Agriculture. See also an earlier note (E. S. R., 71, p. 72).

Efficiency of single and double restrictions in randomized field trials with cotton when treated by the analysis of variance, O. A. POPE (*Arkansas Sta. Bul. 326 (1936), pp. 28*).—Field tests with cotton employing doubly restricted randomized field arrangements in the placement of varieties permitted an appraisal of the practical efficiency of restricted random arrangements when the analysis of variance is applied in reduction of data. The study included 40×8, 24×6, 18×6, and 16×8 double restrictions and 8×8 and 6×6 Latin squares; and for each test from 6 to 44 variables ranging from yield and acre value to specialized laboratory measures of fiber quality, were considered. The comparative efficiency of singly and doubly restricted with unrestricted analyses was interpreted from the percentage reduction in error variance, and the percentage increase in number of unrestricted replications required to produce the error variance secured by double and single restriction.

A significant increase in accuracy usually may be expected from restricted arrangements of field tests. The relative efficiency of row-column restrictions varies considerably among variables within tests. In these studies the efficiency of restricted arrangements was found greatest for yield and acre value, where increases of from 100 to more than 400 percent in number of unrestricted replications often would have been needed for comparable accuracy.

Variables, such as mean length and lint percentage, largely determined by the plant's genetic constitution, were found to have smaller increases in efficiency due to restriction, than did variables greatly influenced by ecological conditions. This indicated that the relative increase in accuracy due to restricted field arrangements might be used in grouping variables with respect to the relative influence of genetic factors and ecological conditions.

The efficiency of restricted arrangements varied between tests of the same size at different locations, as well as between tests of different sizes. All sizes and arrangements used were capable of significantly increasing the accuracy of interpretation. In general, greater efficiency of restricted arrangements was found in tests located on permanent experimental blocks arranged in an orderly manner. Decreases in efficiency were roughly proportional, inversely, to the amount of care used in selecting the experimental area. Even with the most careful selection of the experimental area, a sufficient increase in accuracy usually results from restricted arrangements to warrant the general use of the method in field experiments.

Flax as an Iowa crop, C. S. REDDY and L. C. BURNETT (*Iowa Sta. Bul. 344 (1936), pp. 15, figs. 3*).—Seed flax is considered well suited to Corn Belt rotations, an excellent nurse crop, and usually more profitable per acre than small grains yet having similar cultural requirements. Production practices recommended from results of station experiments and experience include early April planting of 3 pk. drilled or 4 pk. broadcast of dust-fungicide treated seed

of such disease-resistant varieties as Red Wing and Bison on a solid weed-free seedbed, preferably on a heavy soil, and harvesting when the bolls are ripe and the stems are yellow. Flax diseases are described, and the possibilities of the crop in Iowa are discussed briefly.

Irish potato investigations, J. C. MILLER and W. D. KIMBROUGH (*Louisiana Sta. Bul. 272 (1936), pp. 13*).—Additional fertilizer tests with potatoes, supplementing those noted earlier (E. S. R., 70, p. 177), suggested top dressing within 2 weeks after planting with 160 lb. of ammonium sulfate where added nitrogen is profitable, but where added nitrogen is beneficial and growers do not wish to top-dress, all the nitrogen may be applied at planting, 800 lb. of 8–8–4 or 8–12–4 fertilizer being used. Organic sources of nitrogen did not surpass inorganic forms. Concentrated fertilizers compared favorably with standard types in results. For the quantity of fertilizer generally recommended in Louisiana, placement had little effect on yield as long as the fertilizer was available to the plant.

Recommendations of 1-oz. sets for general planting and 1.5-oz. for very early planting, spaced 14 in. apart in the row and covered 4 in. deep, and the application of 800 lb. per acre of 4–8–4 or 4–12–4 fertilizer on a 3.5-ft. row basis, are repeated.

[Potato production in Nebraska] (*Nebr. State Bd. Agr. Ann. Rpt., 1935, pp. 649–706, figs. 3*).—This group of papers includes The Effect of the Previous Crop Upon the Following Potato Crop During Dry Years, by G. Schmid and H. O. Werner (pp. 649–651); The Potato and Its Uses of Soil Moisture Under Irrigation, by L. Bowen (p. 651–657); Irrigation of Potatoes, by W. C. Edmundson (pp. 657–661); Present Day Problems in Marketing Potatoes, by O. Frank (pp. 661–665); The Present Economic Position of the Potato Crop, by E. F. McKune (pp. 666–674); Some Ideas About Grading North Platte Valley Potatoes, by C. Thomas (pp. 674–677); Some Bothersome Pests of Potatoes and Their Control, by H. M. McLean (pp. 677–679); A Review of the Literature on the Physiological Aspects of the Storage of Potatoes, by H. O. Werner (pp. 680–703); and Planting Potatoes in a Dry Season, by M. Koehnke (pp. 703–706).

Frost resistance of potato species [trans title], V. RAZUMOV (*Trudy Prikl. Bot., Genet., i Selek. (Bul. Appl. Bot., Genet., and Plant Breeding), 3. ser., No. 6 (1935), pp. 221–226, fig. 1; Eng. abs., Sum. [Sect.], p. 16; abs. in Ann. Agron. [Paris], n. ser., 6 (1936), No. 1, p. 163*).—Tests of frost resistance of various species of potatoes from South America showed that most of them were low in frost resistance if they had not been subjected to preliminary hardening. Resistance was found to vary with age and development of the plant.

Influence of late frosts on winter rye [trans. title], V. I. ȷAKOVLEV (YAKOVLEV) (*Trudy Prikl. Bot., Genet., i Selek. (Bul. Appl. Bot., Genet., and Plant Breeding), 3. ser., No. 6 (1935), pp. 153–161; Eng. abs., Sum. [Sect.], p. 12; abs. in Ann. Agron. [Paris], n. ser., 6 (1936), No. 1, pp. 162, 163*).—Experiments with winter rye grown in wooden boxes and in the field showed, under the conditions of the experiments, that "low air temperatures up to —3° and 3.5° C. exerted no perceptible harmful influence on development and yield of the rye varieties experimented with, either in the period of earing or that of flowering. Thus it may be supposed that under certain conditions of hardening, frosts of such strength do not prevent the normal development and productivity of . . . winter rye varieties. The resistance of varieties of winter rye to greater frosts is lower in the period of flowering than in that of earing."

Timothy-seed production, M. W. EVANS (*U. S. Dept. Agr. Leaflet 115 (1936), pp. 8, figs. 3*).—Harvesting and threshing methods and other production practices for the timothy seed crop are outlined, with remarks on the germination, impurities, marketing, domestic production, and importation of timothy seed.

Soil moisture and winter wheat with suggestions on abandonment, A. L. HALLSTED and O. R. MATHEWS (*Kansas Sta. Bul. 273 (1936), pp. 46, figs. 4*).—The results of prolonged studies at Hays, Colby, and Garden City, Kans., in cooperation with the U. S. Department of Agriculture, the progress of which was reported on earlier by Call and Hallsted (E. S. R., 34, p. 338) and by Hallsted and Coles (E. S. R., 64, p. 135), are brought up to date and adapted as far as possible to all of western Kansas. The publication endeavors to acquaint farmers with methods of determining at seeding time their chances of obtaining a paying crop and of ascertaining relatively early in the spring whether or not the crop should be abandoned.

The depth to which a given soil is wet at seeding time is considered a reliable measure of the amount of available water in that soil and has, on the average, borne a very close relationship to the yields obtained. Sandy soils must be wet deeper than heavier soils to carry the same amount of water. With the comparatively heavy soils at any of the three stations wet to a 3-ft. depth, a good yield was fairly well assured and only very adverse conditions during the growth of the crop were able to cause low yields or failure, whereas with the soil dry or wet to only a few inches at seeding time, poor yields or failures resulted more often. When little or no rainfall occurs soon after planting on soil moist to only a few inches, the probability of failure is greatly increased, and if dry weather continues through the winter, the probability of failure is so increased that abandonment usually is advisable. When the initial soil moisture is deficient and the precipitation is low to April 1, abandonment of the crop and conservation of water in a summer fallow for a future crop probably will pay far better than allowing the water to be wasted by the poor crop and weeds.

Early preparation at Hays resulted in the soil's becoming wet deep enough to give the wheat crop a good start in most years, while late-prepared land often was dry or nearly dry at seeding time. Rainfall after seeding seldom compensated for lack of storage of water between harvest and seeding. Although early preparation was not effective in storing water at Garden City in all years, it increased the yield materially in years when considerable quantities of water were stored. It increased the average yield without materially reducing the danger of failure. Early cultivation at Colby slightly increased the average quantity of available water in the soil without increasing the yield. At Garden City and Colby fallowing was necessary to insure a crop equal to that provided by early cultivation at Hays.

Causes reducing resistance of wheat to winter-killing [trans. title], F. M. KUPERMAN and A. I. ZADONTSEV (*Trudy Prikl. Bot., Genet., i Selek. (Bul. Appl. Bot., Genet., and Plant Breeding), 3. ser., No. 6 (1935), pp. 97–120; Eng. abs., Sum. [Sect.], pp. 8, 9; abs. in Ann. Agron. [Paris], n. ser., 6 (1936), No. 1, pp. 147, 148*).—Among the factors enumerated as reducing resistance of wheat to winter-killing are late seeding, warm weather in autumn and cold weather in spring, and an inadequate snow cover in winter. Resistance varied widely at different stages of growth. On entering the second stage of development the capacity of plants to become hardened diminishes. Light enhances the resistance of plants in the first stages of development but diminishes it in the second stage. An insufficient supply of carbohydrates in the plants in autumn

makes them more susceptible to winter-killing. "In order to control the winter-killing of crops, it is necessary, in availing ourselves of the data of physiology on the development of winter wheats, to breed new winter-hardy varieties which, sown out on early dates, would show no decrease in hardiness (or only an inconsiderable one, after germination of the first stage)."

What is State certified seed? H. B. SPRAGUE (*New Jersey Stas. Circ. 364 (1936), pp. 2*).—State certified seed is defined and the requirements for such seed are outlined, together with a list of varieties of corn, wheat, oats, barley, rye, and soybeans approved for State certification in New Jersey.

Summary of results of seed and legume inoculant inspection for 1935, J. G. FISKE (*New Jersey Stas. Bul. 598 (1936), pp. 23*).—The dealers in New Jersey from whom the 2,007 official samples of crop and vegetable seed and seed mixtures were collected in 1935 are listed with compliances and violations indicated; and the crops, inoculation, and number of organisms are shown for 55 official samples of legume inoculants.

Control of broom sedge, L. R. NEEL (*Tennessee Sta. Circ. 57 (1936), pp. 4*).—Experiments in the control of broomsedge by pasturing and seeding to legumes and by mowing, pasturing, and fertilizing are reported from the Middle Tennessee Substation.

Broomsedge, an upright perennial grass reproducing only from seed, is reduced in vigor and its life shortened by mowing or close cropping, preferably by cattle, at the proper time to prevent seed formation. To be most effective in control, enough cattle should be confined to the infested area to keep down the growth through spring and early summer, normal gains being maintained by cottonseed meal as supplemental feed. Broomsedge in its tender stage is valuable as pasture, and cattle grazing it off to hold it in check normally will gain some weight, although not as fast as when pasturing good tame grasses. A good level of soil fertility also is essential so that bluegrass, white clover, or other tame plants will crowd out the broomsedge. Mainly by stimulating a better growth of white clover, lime aids in broomsedge control on Central Basin soils, while outside of this area phosphatic fertilizers are very important in pasture improvement and broomsedge control.

HORTICULTURE

[Horticultural studies by the New Haven Station] (*Connecticut [New Haven] Sta. Bul. 381 (1936), pp. 168, 169, 186, 187*).—Brief reports are given upon the results of breeding studies with sweet corn, peppers, squash, lima beans, tomatoes, and strawberries.

[Horticultural investigations by the Hawaii Station] (*Hawaii Sta. Rpt. 1935, pp. 10, 11, 12–20, 27, 28, figs. 5*).—Results are presented in brief form on the hybridization of the akala raspberry, propagation of annonaceous fruits, culture of the passion fruit, breeding of lettuce, varieties and cultural requirements of tomatoes and garden beans, breeding of sweet corn, culture and handling of the Macadamia nut, culture and handling of the coffee plant, including observations on fertilizers and on the chemical composition of the cherry, and observations on miscellaneous tropical horticultural plants.

Horticultural work, consisting chiefly of horticultural and varietal trials at the Haleakala and Kona Substations, is briefly discussed.

[Horticulture at the Maine Station] (*Maine Sta. Bul. 380 (1935), pp. 204–208, 214–218, 224, 226–228, 229, 230, figs. 7*).—Reports are presented on the results of studies in apple breeding, relation of apple tree size at planting to subsequent development, effect of winter injury on the growth of apple trees, pollination

of the McIntosh apple, relation of stage of flower development to self-incompatibility in the apple, varieties of raspberries and strawberries, breeding of strawberries, breeding of sweet corn, culture and varieties of field and snap beans, general vegetable varieties, culture of lettuce, and varieties and culture of tomatoes, all by R. M. Bailey and I. M. Burgess; apple storage, by Bailey and F. B. Chandler; anatomy of winter-injured apple tissues, by F. H. Steinmetz and M. T. Hilborn; pollination of blueberries, the burning of blueberry fields, and chemical composition of blueberries, by Chandler and I. C. Mason; blueberry breeding, by Chandler, Bailey, and Mason; and the borax requirements of rutabagas, by Chandler, J. A. Chucka, and Mason.

[Horticulture at the South Mississippi Branch Station], J. C. ROBERT and S. R. GREER (*Mississippi Sta. Bul. 310 (1935), pp. 12–16, 17–19, figs. 5*).—Cultural and fertilizer trials with tung-oil trees are briefly reviewed, the results presented of investigations on culture and varieties of various small fruits and vegetables, and on a lime test for spinach as a control for "damping-off disease."

[Horticultural investigations by the Ohio Station] (*Ohio Sta. Bul. 561 (1936), pp. 52–56, 57–61, 64–68, fig. 1*).—Brief reports are presented on studies of cyanamide and potash for orchard trees, by J. H. Gourley; soil management systems for nonbearing and young bearing pear trees, and the development of female sex cells in the apple and its relation to fruit setting, both by F. S. Howlett; the interrelation of water in fruit trees and in the soil, by Howlett and R. Bradfield; testing of different kinds of grafting wax, by C. W. Ellenwood; fruit thinning of the peach, straw mulch for black raspberries, and anatomy of the transition region in salsify, all by L. Havis; effects of soil moisture upon the growth and yield of greenhouse tomatoes, and effect of nitrate and ammonium nitrogen on the growth of greenhouse tomatoes in soils of different reactions, both by I. C. Hoffman; variety tests of lettuce, peas, and cauliflower, by Romshe and H. D. Brown; variety tests of cabbage and tomatoes, by O. N. Riley and Brown; fertilizer tests with vegetables, by Brown and Romshe; effects of light on greenhouse plants, by A. Laurie and G. H. Poesch; fertilizers for carnations; effect of nitrogen on the keeping quality of cut flowers; control of chlorosis in oaks and hydrangeas; and effect of low temperature on Matthiolas, value of cloth houses for flowering plants, construction of electric hotbeds, outward manifestations of nutrient deficiencies, propagation of ornamentals, subirrigation, soil reaction for snapdragons, varieties of gladiolus for forcing, and varieties of hardy chrysanthemums, all by Laurie.

How poisonous is spray residue? T. J. TALBERT (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 170–174*).—In this discussion of the spray residue problem the author questions and minimizes the hazard from toxic residues on fruit, and presents figures on the arsenic content of various sea foods and on the lead content of drinking waters as a comparison.

Lead residues and their removal as influenced by spray programs, M. H. HALLER, J. H. BEAUMONT, C. W. MURRAY, and C. C. CASSIL (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 179–182*).—Spray residue removal experiments carried on with apples grown near Frederick, Md., and Kearneysville, W. Va., indicated that fish or mineral oils may be added to the first two lead arsenate cover sprays without influencing the amount of residue or its removal. Later use of mineral or fish oils or of casein-lime spreader increased the amount of spray residue at harvest. Mineral oil was particularly troublesome and increased not only the amount but the difficulty of removal. As compared with five cover sprays, seven increased the residues and the difficulty of removal.

Asparagus investigations in south Louisiana, W. D. KIMBROUGH (*Louisiana Sta. Bul. 270 (1936), pp. 11*).—Seeking an explanation of why commercial attempts to grow asparagus in Louisiana have not been successful, Mary Washington plants grown from seed planted in the spring of 1930 and set in the field in December 1930 were handled in different ways with respect to time of cutting and fertilizers. The plants grew vigorously the first year but sent up a new set of shoots approximately every month. The first regular harvest was in the fall of 1932. Plants cut only in the autumn and in both autumn and spring produced only light fall yields, reaching almost nothing in the third season. Cutting in autumn reduced materially the yields the following spring. The maximum yields of No. 1 asparagus were produced in the plats cut in the spring only.

Studies of the relation of sex to yield showed the staminate to outyield consistently the pistillate plants. In a test of the best time to begin cutting, small cuttings the first year after setting did not affect subsequent yields, and although yields the third season were somewhat larger on plants not cut until that time, the differences were not great, and all yields were small. The results of fertilizer tests did not show any consistent increase from fertilizer, although the yields were somewhat higher.

Analyses of the crowns from plants cut only in the fall showed nonreducing sugars, the important food reserves, to be rapidly depleted. When reserve sugars were reduced to between 4 and 5 percent of the fresh weight, only very small spears were produced. Analyses of crowns from other plants gave evidence that not enough reserves are stored to produce good yields. This held true even in the case of plants not cut at all. The continued growth of new shoots was apparently too great a drain on the food reserves. The quality of the asparagus was excellent, but the low yields and small spears were limiting factors. It is believed, however, that for home use and local market there is a limited opportunity for the crop in this region.

The influence of soil acidity and soil type upon the growth and composition of the lima bean plant, J. B. HESTER (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 600–603*).—Utilizing three types of soil, Portsmouth loamy fine sand high in organic matter and with a low pH value, Bladen sandy loam medium in organic matter and low in pH value, and Norfolk fine sand low in organic matter and relatively high in pH, the Virginia Truck Experiment Station found in the case of Henderson bush lima beans growing in pots that the type of soil exerted a marked influence in determining the optimum soil reaction for growth, and in turn soil reaction exerted a strong influence on nutrient assimilation. Measurements on the crop showed that the total weight maxima were reached at pH 5, 6.4, and 6.6, respectively, in the three soils. The quantity of calcium leached increased as the soil reaction increased but not in proportion to the quantity of replaceable calcium present. The quantity of potassium leached decreased at high pH values due to plant absorption. Aluminum appearing in solution in the more acid soils of all three types accounted for low yields at these points. At the pH value favoring maximum production the soil evidently carried a desirable nutrient balance; for example in the case of Portsmouth loam the desirable combination for the lima bean occurred at about 5, and although the amount of replaceable calcium was much greater at 6.7 there was very little change in the concentration of potassium ions. The ratio of calcium, potassium, and nitrogen in the plants fell within the broad limits of calcium 2 to 3, potassium 1, and nitrogen 3 to 4.

Fertilizer experiments with Yellow Bermuda onions in the Winter Garden region of Texas, L. R. HAWTHORN (*Texas Sta. Bul. 524 (1936), pp. 35*).—

Using four replications for each treatment and extending the work over a period of 4 yr., the author found that on the soil utilized, phosphoric acid was the chief limiting nutrient with respect to yield, with nitrogen next, and potash least important; in fact the potash increased yields slightly the first year and thereafter tended to decrease them. In both the case of phosphorus and nitrogen there was evidently a residual effect, so that continued applications did not have an equal influence.

On new soil, increments in amount from 0 to 1,800 lb. per acre of a 6–12–6 mixture increased the yields of U. S. No. 1 onions as well as total yields. Above 1,200 lb. the applications were scarcely profitable even the first year, and in succeeding years 900 lb. was about the maximum. Ammonium sulfate applied alone in amounts greater than 180 lb. was hardly profitable on new soil. Twenty percent superphosphate applied alone was more effective than ammonium sulfate alone. Nitrogen and phosphorus in combination at a rate equivalent to 600 lb. of 6–12–0 were usually more effective than either nutrient applied singly. Side dressings of any kind were not as effective or economical as materials applied before transplanting. The relative effects of different nitrogen carriers are considered. Other conditions being equal, onions receiving adequate amounts of well-balanced fertilizer matured in certain seasons a week or more in advance of unfertilized onions. High nitrogen fertilization seemed to have a detrimental effect on keeping. The harmful effects of thrips were overcome partially by fertilization, but the development of pink root disease was not influenced by ordinary applications.

Pungency of onions in relation to variety and ecological factors, H. PLATENIUS and J. E. KNOTT (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 593–595*).—Using a test which involved determination of the sulfur in the volatile onion oil obtained by steam distillation, observations were made at Cornell University on the pungency of a number of onions grown in various parts of the United States. From the readings varieties were grouped into distinctly mild, intermediate, and pungent classes. In a single variety grown in widely separated localities there were slight but fairly consistent differences in pungency, and in general onions from California were more pungent. It was thought that temperature (and possibly relative humidity) prevailing during the ripening season plays an important role in determining the relative pungency of the bulbs.

Effect of ammonium and of nitrate nitrogen on the composition of the tomato plant, H. E. CLARK (*Plant Physiol., 11 (1936), No. 1, pp. 5–24*).—At the Connecticut State Experiment Station, Marglobe tomato plants produced from seed of a single mother plant were grown in sand cultures of pH 6.7 and supplied with nutrient solutions the N of which was derived from calcium nitrate in one instance and from ammonium sulfate in the other two. A high concentration of nitrate N was found in the nitrated plants, with the result that total inorganic or unassimilated N was much higher in the nitrate series. A considerably greater concentration of ammonium N was found in the ammonium sulfate series. Plants receiving ammonium sulfate in lesser concentration made practically as much top growth as those receiving the full supply but accumulated less ammonium N in their tissues. Much greater quantities of glutamine and asparagine N were present in the ammonium than in the nitrate plants, indicating the ready formation of amide from ammonium N. A greater concentration of soluble organic N was found in the ammonium than in the nitrate plants. The percentage of ash was higher and the percentages of oxalic, malic, and citric acids were much higher in the nitrate plants, suggesting an interrelationship between the absorption and

assimilation of N, the accumulation of ash constituents, and the synthesis of organic acids.

Growing tomatoes in Illinois, W. A. HUELSEN (*Illinois Sta. Circ 451 (1936), pp. 28*).—Supplementing the discussion with certain pertinent experimental results obtained at the station and elsewhere, the author presents information on the importance of the crop, effects of drought and temperature, soil adaptation and preparation, fertilizers, growing and setting of plants, cultivation, training, harvesting and handling, varieties, etc.

Total soluble solids and sugars in watermelons, D. R. PORTER and C. S. BISSON (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 596–599*).—In seeking a rapid and accurate method of determining relative sweetness in watermelon varieties and seedlings, the California Experiment Station at Davis compared readings made with the refractometer with the results of chemical analyses and reached the conclusion that the refractometer indirectly detects significant variation in the sugar content of composite samples of extracted juice. In immature fruits of the Klondike variety the percentage of monosaccharides is considerably higher than the percentage of disaccharides, but as maturity was reached the ratio was reversed gradually until in overripe melons the disaccharides were more abundant than the monosaccharides. Total sugar did not increase appreciably after the fruits matured, although the ratio of the two sugar groups was reversed.

Status of orchard soil moisture research, J. R. MAGNESS (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 651–661*).—This is a comprehensive discussion of the present status of the soil moisture problem as related to the orchard. Among subjects discussed are the importance of abundant soil moisture in the production of high quality fruit, factors underlying the supplying of water to the tree, foliage, and fruit, and the need of further research on the moisture problem.

Frost resistance of fruit trees [trans. title], I. KH. SHMELEV (*Trudy Prikl. Bot., Genet., i Selek. (Bul. Appl. Bot., Genet., and Plant Breeding), S. ser., No. 6 (1935), pp. 263–277, fig. 1; Eng. abs., Sum. [Sect.], pp. 19, 20; abs in Ann. Agron. [Paris], n. ser., 6 (1936), No. 1, p. 164*).—Frost resistance of apple varieties was determined by freezing the trees in refrigeration chambers and by observations under field conditions. The results showed that the growth conditions (soil moisture, transplanting from the nursery to the orchard, and mineral fertilizers) in summer exert an influence on frost resistance in winter. Frost resistance was found to be variable, depending largely upon these conditions. Dry weather in the second half of summer checked the growth of the trees and increased their frost resistance in winter. Good weather during this period prolonged and increased the growth of the trees and decreased their resistance to low temperature. Under unfavorable summer conditions the young apple trees, transplanted in spring from the nursery to the orchard, showed a weakened growth of their vegetative parts in the second half of the summer. They entered the wintering stage having made but little growth and, to a certain degree, in an exhausted condition and they were not able, therefore, to develop high frost resistance. One-year-old apple trees, after transplanting, lost their frost resistance in a higher degree than two-year-old trees. The latter support transplanting better and are less injured in winter.

Fertilizing fruit trees with nitrogen, A. E. MURNEEK (*Missouri Sta. Bul. 363 (1936), pp. 20, figs. 6*).—Stating that under Missouri conditions most orchards benefit from the application of nitrogenous fertilizers, the author discusses the kinds of material to use, time of application, relation to regular bearing, amounts and methods of application, and the effects of nitrogen on growth

and on the fruit. Calcium cyanamide is said to be widely used in Missouri apple orchards without harmful effects. For peaches, however, large amounts of calcium cyanamide in late spring may cause injury to trees on light sandy soils. With cherries it is preferable to apply the cyanamide in autumn. The author estimates that a bearing 20-year-old apple tree uses each year an amount of nitrogen corresponding to 5.8 lb. of a fertilizer containing 20–21 percent of nitrogen, with 1.2 lb. returned to the soil by decaying fruit, flowers, and leaves. Trees of this age should receive 5 lb. of such a fertilizer per year.

The translocation of nitrogen in woody plants, W. E. LOOMIS (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 61–64*).—Analyses at the Iowa State College of samples of apple, poplar, and boxelder wood collected throughout the year showed that large quantities of protein N are stored in the bark and wood. It is believed that nitrogenous salts are synthesized in the normal roots of apple and other species to organic compounds, which are then readily translocated only in the phloem. Where rings of phloem were removed there was an accumulation of soluble organic N below the wound. An analysis of the leaves on ringed branches showed them to contain only two-thirds as much N on either a green weight or area basis as the leaves on unringed branches. Because N was found to move upward past a phloem ring under two conditions, (1) when storage tissues were showing injury as a result of continued ringing, and (2) when the carbohydrate level of the roots was reduced to a low point, the author suggests that inorganic N can pass through normal cell membranes into the transpiration stream but that organic N does not readily penetrate these membranes. In consequence its movement, both upward and downward, is normally confined to the plasmodesmal connections between living cells and especially developed in the phloem.

A method of studying pollen germination on the stigma in practical pollination [trans. title], A. S. TATARINTSEV (TATARINTZEFF) (*Nauch. Plodovod. [Michurinsk], No. 6 (1935), pp. 45–49; Eng. abs., p. 49*).—A 1-percent methylene blue solution was found useful in studying pollen tube growth in the crushed stigma of various rosaceous plants, such as the apple, pear, strawberry, raspberry, and hawthorn, preserved in a 3-percent formalin solution.

Michurin apple varieties in Siberia [trans. title], S. I. ISAEV (ISAUEFF) (*Nauch. Plodovod. [Michurinsk], No. 6 (1935), pp. 3–11, figs. 2; Eng. abs., p. 11*).—Of three varieties of apples originated by Michurin, namely, Tayezhnoye, Kytayka zolotaya, and Vermak, grown in Siberia in a location where the temperature reaches 67° F. below zero, the first variety was cold resistant. The others did not survive except where grown as trailing plants and covered with snow.

The influence of sugar, nitrogen fertilizers, and of ringing Gravenstein apple trees upon color and maturity of the fruit, F. W. ALLEN (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 52–55*).—Applications by the California Experiment Station at Davis of 50 lb. of dissolved corn sugar to large Gravenstein apple trees reduced the nitrates in the soil, and in one case raised slightly the percentage of soluble solids in the fruit. Girdling in the case of 11-year-old trees resulted in a somewhat higher content of soluble solids in the fruits. Heavy applications of calcium nitrate resulted in increased soil nitrates but had no influence on the tree. Application of cane sugar failed to bring about any appreciable or consistent differences in color or firmness of fruits but did increase the percentage of soluble solids in early-picked apples. At the final harvest there was no difference in soluble solids between the sugar-treated and the nitrated trees. Girdling again increased the soluble solids in the fruit and in some cases promoted a better color.

Some experiences with the Thornton test for potash in apple trees, J. K. SHAW (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 56–60*).—The evaluation by the Massachusetts Experiment Station of the Thornton test as a means of indicating K needs of apple trees suggested that the test, if conducted with a rigid technic, may be useful in showing differences between high and low K contents and thus indicate the K requirements of the trees. Leaf petioles cut uniformly were found the most suitable part of the tree for sampling, but it made little difference from what location on the tree the leaves were taken. Differences observed as a result of the time of sampling suggested that it may be necessary to establish standards. In one lot of trees the data obtained by the Thornton test were checked with chemical analyses and in five of six cases were in agreement. The application of the Thornton test to leaf samples collected from 10 different orchards scattered over the State showed only one orchard deficient in K. Some indication was seen that varieties of apples differ in their capacity for absorbing K.

Some problems in apple spraying in Pennsylvania, H. W. THURSTON, JR., and H. N. WORTHLEY (*Pennsylvania Sta. Bul. 324 (1936), pp. 19, figs. 3*).—Pointing out the constant change in spraying practices and the fact that some of the most effective materials may, under certain conditions, injure the fruit and foliage, the authors discuss the results of various experiments designed to discover safer materials and practices. Tests in 1935 on McIntosh and Stayman Winesap apple trees showed few significant differences with respect to scab control, but it is pointed out that all the trees received some liquid lime-sulfur preceding bloom. In the face of a large amount of fruit russet, all treated plats displayed more injury than the controls. Some of the so-called mild sulfurs produced more injury than standard liquid lime-sulfur used throughout the season.

Tests of various materials in the delayed dormant spray again showed the superior capacity of tar combinations for controlling rosy aphid. Observations in August on the prevalence of white apple leafhoppers and European red mites on the fungicide plats indicated that sulfur in no form influenced the leafhopper population but that copper sprays did reduce infestations. Both liquid and dry lime-sulfur gave partial control of the European red mite.

Trials of new materials for the control of codling moth suggested that lead arsenate must still be the main reliance in the first brood sprays. Three cover sprays of lead arsenate followed by oil sprays left residues well above the tolerance, but one cover spray fell safely below whether followed by oil or not. Copper fungicides in the summer schedule were found in certain cases to cut down the effectiveness of lead arsenate.

Comparisons of the cost and effectiveness of an 8-nozzle broom spray from the top of the tank with two single-nozzle guns operated on the ground showed the broom to use more material, but on the whole there was no pronounced advantage in favor of either equipment.

Relative value of several wetting agents in removing lead residues from apples, J. H. BEAUMONT and M. H. HALLER (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 183–189*).—Using a Wayland flotation washer and Grimes Golden and York Imperial apples sprayed according to two schedules, a comparison was made of seven different wetting agents as aids in the removal of lead residue. Of the seven, two had no beneficial effect, one was intermediate, and four were effective, but of the four only two, Vatsol and Nekal B, caused no injury to the fruit at temperatures of 100° F. Increasing the temperature of the washing solution from 70° to 100° greatly increased its effectiveness. The fish and mineral oils used with lead arsenate influenced the residues at harvest

and also the effectiveness of the different wetting agents. One percent of sodium chloride had no effect on the wetting agent solutions.

Additional experiments on spray residue removal, F. L. OVERLEY and E. L. OVERHOLSER (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 175–178*).—Analyses made by the Washington Experiment Station of the residue remaining on Winesap apples, sprayed according to three codling moth schedules and washed in different commercial machines operated by large growers in Washington and Oregon, indicated that apples can be cleansed satisfactorily provided the proper washing materials are used in effective equipment. Apples sprayed with lead arsenate in combination with a soap spreader, or with lead arsenate and mineral oil and fish oil emulsified with oleic acid or sodium silicate, or with lead arsenate and kerosene soap, may be effectively washed with the better flood or agitation types of the commercial tandem washers, utilizing both sodium silicate and hydrochloric acid washing solutions.

The relation of soil moisture to pear tree wilting in a heavy clay soil, R. A. WORK and M. R. LEWIS (*Jour. Amer. Soc. Agron., 28 (1936), No. 2, pp. 124–134, figs. 3*).—Intensive sampling of the soil surrounding an Anjou pear tree on French roots growing on Meyer clay adobe soil near Medford, Oreg., and which showed definite suffering from water shortage revealed no material portion of the root zone within 3.2 percent of the permanent wilting point. It was evident that the movement of water through the soil by capillary action was too slow to maintain a uniform moisture condition. Since the roots did not occupy the entire soil mass in the heavy soil in question, the authors suggest the possibility that moisture content of the soil in contact with the absorbing roots may have actually been at, or near, the permanent wilting point, while that of the soil only a few millimeters away may have been considerably higher.

Distribution of certain sugars in Bosc pears, W. E. MARTIN (*Plant Physiol., 11 (1936), No. 1, pp. 139–147, figs. 2*).—Beurre Bosc pears harvested August 26, 1934, from a full-bearing tree growing near Phoenix, Oreg., were examined by the Oregon Experiment Station upon their removal from storage on January 20, 1935, as to the localization of sugars. The fruits were divided on the basis of anatomical structure into four regions, namely, (1) skin region, (2) cortical region, (3) stone cell region, and (4) core region, in which were located respectively, 11, 54, 28, and 7 percent of the fresh weight. Levulose was found predominant in all portions except the skin, with the highest concentration in the cortical and core regions. Sucrose was observed in largest amounts in the stone cell region and dextrose in the skin region. The bearing of the observations on methods of sampling Beurre Bosc pears is discussed.

A growth study of the cherry fruit, O. LILLELAND and L. NEWSOME (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 291–299, figs. 2*).—Cross-diameter measurements made at the California Experiment Station, Davis, upon the growing fruits of the Early Purple Guigne, Napoleon, Chapman, and Lambert cherries in 1933 and the same varieties plus Downer and Lewelling in 1934 showed marked periodicity in the growth curves of all varieties, characterized by early rapid development, an interim of lesser growth, and a final period of very rapid enlargement. The emergence of varieties from the interim period was in the order of ripening. An examination of comparable fruits showed a general agreement between the cessation of growth of the endocarp and the beginning of the depressed period. The appearance of the embryo seemed to be independent of the time of maturity of the fruit; for example, embryos were detected as early in Downer as in Early Purple Guigne. Early-ripening varieties did not characteristically contain aborted embryos, but the seeds did shrivel

more during afterripening than did those of late varieties. Embryo abortion is defined as the premature cessation of growth or is evidence of disintegration while the fruit is on the tree. The authors suggest that the very short maturation period in early varieties of cherries results in a kernel low in fat and in consequence a nutritionally deficient embryo, resulting possibly from food competition and the early maturity of the flesh.

Seven years' results of the hardiness of Elberta fruit buds in a fertilizer experiment, R. L. McMUNN and M. J. DORSEY (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 239–243, fig. 1*).—Records taken by the Illinois Experiment Station on the percentage of living buds on peach trees included in its fertilizer experiment in Johnson County showed that hardiness was not influenced significantly by fertilizer treatment. There was a definite indication that a heavy fruit crop may lower resistance of buds, for in 1931 following no crop there was no killing with a minimum of 4° F., while in 1932 there was considerable killing despite a minimum of only 13°. There was also some indication that excessive rainfall in spring and early summer lowered the resistance of the buds formed that year. Splitting the application of fertilizer had no effect on bud survival.

Peach storage with special reference to breakdown, P. L. HARDING and M. H. HALLER (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 160–163*).—In this second paper on peach storage (E. S. R., 70, p. 480), the authors report the results of tests on 12 varieties stored in bushel baskets at 32° and 40° F. No break-down developed at 32° or during subsequent ripening at 70° in New Jersey 66, New Jersey 12722, and Slappey. Early Crawford and Late Crawford developed under the same conditions 5 and 9 percent of break-down. Break-down developed in Elberta, J. H. Hale, Belle, and Augbert after 4 weeks at 32° and in Hiley and Champion after 3 weeks at 32°. All varieties developed break-down at 40°, usually after 2 weeks. At 31° or 32° New Jersey 66 and New Jersey 12722 kept satisfactorily for 4 to 5 weeks, Late Crawford and J. H. Hale 4 weeks, Slappey, Augbert, and Elberta 3 to 4 weeks, and Belle, Champion, Hiley, and Carman for 2 to 3 weeks.

Certain physiological effects of carbon dioxide treatments of plums, A. L. RYALL (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 164–169, figs. 2*).—Yakima Valley Italian prunes harvested at optimum commercial maturity and exposed for short periods prior to storage to different concentrations of CO_2 showed distinctly less softening and less mold development after storage than did the untreated fruits. Concentrations of 40 percent CO_2 or more usually caused a marked increase in the ethyl alcohol and acetaldehyde contents, yet no off flavors could be detected during the first 2 weeks of storage in any of the prunes. Whereas the respiration rate of the checks and the 20-percent CO_2 lots showed an upward trend with continued storage, the 40- and 60-percent lots showed a lower output immediately after treatment and the output decreased subsequently. There was noted an apparently higher reducing sugar and lower sucrose content in 40-percent CO_2 lots than in the 20-percent and control lots. Flesh browning around the pits developed in all fruits after continued storage and is believed to be an accompaniment of normal deterioration.

Fruit-bud differentiation in the Sugar prune, C. H. RAGLAND (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 50, 51, fig. 1*).—The examination by the University of California at Davis of samples of buds collected from nonfruiting Sugar prune trees at 2-week intervals beginning May 9, 1934, showed a slight broadening of the growing point by June 4, and 1 week later differentiation had begun definitely. By June 9 slight protuberances representing the primordia of individual flower buds were evident. The petal primordia were observed

by July 8. Flower bud differentiation appeared to occur rather uniformly in all the buds of nonbearing trees.

Seedlessness in grapes, A. B. STOUT (*New York State Sta. Tech. Bul. 238 (1936), pp. 68, pl. 1, figs. 46*).—In this study, conducted cooperatively by the station and the New York Botanical Garden, it was observed that there are in grapes three main types of ovules, (1) abortive at some stage and unable to function in fertilization, (2) functional in fertilization, with seeds aborting during development, and (3) those which are able to develop by apogamy or after fertilization into a mature seed which may or may not contain an embryo. The second condition is designated as stenospermy. The fruits are said to be of three main classes, (1) parthenocarpic, either obligate, when all ovules are aborted, or facultative, in which case seedless fruits develop only when there is no pollination, (2) stenospermocarpic, when one or more stenospermic seeds are present, and (3) seeded, when a berry contains one or more hard seeds. As a rule both stenospermocarpic and seeded fruits contain some aborted ovules, and the proportion of abortion is fairly constant in each clonal variety.

Seedless grapes are either parthenocarpic, with mere rudiments of seeds, or stenospermocarpic. In the latter case abnormalities appear soon after fertilization in the form of feeble development of sclerenchyma and other tissues which combine to give shape, size, and character to the seed. The endosperm and embryo remain in a partially developed stage, and the largest seeds in mature berries are undersized, abnormal in shape, and soft. There may be two, and even three, types of berries on a single plant. Poorly filled clusters also occur (1) when some flowers have rudimentary or aborted pistils, (2) when some ovaries contain only aborted ovules and no parthenocarpy occurs, and (3) when pollination is necessary but some pistils are not pollinated.

Crosses between seedless grapes of the vinifera type and various hardy seeded varieties yielded seedlings a large proportion of which bore fruits with at least one hard seed per berry, but a few produced fruits containing only aborted seeds of small size. Between these two conditions there were many intermediates. Some of the more promising seedlings are being propagated for testing.

An inherent unstable strain of the Valencia orange, A. D. SHAMEL and C. S. POMEROY (*Calif. Citrogr., 21 (1936), No. 5, pp. 153, 186, 187, fig. 1*).—Following a brief discussion concerning the introduction of the Valencia orange into California, the authors report the results of observations on variability of fruit and foliage in an orchard of the Hart Tardiff strain located at Corona, Calif. Since many inferior limbs had been removed in former years and inferior trees top worked, the data are not complete but are indicative. Of 4,911 trees inspected, 618 had bud variants, as indicated by fruit, and 74 leaf variants. The most frequent type of variation observed was the corrugated and ribbed, which included 4.38 percent of all the trees and which is almost worthless commercially. The Navel type found on 1.77 percent of the trees had very firm and juicy fruits of attractive flavor.

The moisture relations of pecan leaves, A. H. FINCH and C. W. VAN HORN (*Science, 83 (1936), No. 2150, p. 260*).—Studies at the Arizona Experiment Station of mature pecan leaves, taken from trees supplied with an excess of moisture and from trees in which the soil of the upper 2 ft. was below the permanent wilting point, showed nearly the same moisture content on days of maximum sunshine, high temperature, and low relative humidity. During cloudy days and at night the moisture content of the leaves increased slightly, with the greater increment in those from the wet plats. Studies of transpiration by

the cobalt chloride method showed that leaves with any appreciable amount of drought necrosis transpired very slowly, if at all, whereas healthy leaves transpired freely under wide extremes of soil moisture. Apparently photosynthetic activity proceeded in the presence of a considerable degree of drought, as was indicated by a greater amount of starch and hemicellulose cell wall thickening in shoots from dry than from wet plats. Nitrogen content of the leaves and other tissues was reduced in the dry plats. The observations suggest that in soil moisture control there may lie an important means for regulating carbohydrates in the tree, and through the carbohydrates the filling of the nuts.

The effect of soil temperature on the growth and flowering of certain greenhouse crops, R. C. ALLEN (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 635–637*).—Matthiola plants grown in the Cornell University greenhouses in beds the soil of which was maintained at 52°, 60°, and 72° F. bloomed somewhat earlier at the lowest temperature. With calendulas and snapdragons a soil temperature of 52° appeared too low for optimum flower production, and the plants showed marked symptoms of nitrogen deficiency. For freezias 60° was the most favorable of the three temperatures.

A method for studying nutrient deficiencies in greenhouse crops, A. LAURIE and E. W. MCELWEE (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 617–619*).—Using an adaptation of the Shives and Stahl constant renewal sand culture method, various flowers were grown in the greenhouse at Ohio State University to observe their response to different nutrient deficiencies. Descriptions are presented of the external manifestations in sweet peas, poinsettias, snapdragons, and cinerarias of the lack of nitrogen, phosphorus, and potassium.

The effects of day length and light intensity on vegetative growth and flowering of the China aster (Callistephus chinensis), K. POST (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 626–630*).—At Cornell University it was found impossible to prevent the flowering of China asters even with day lengths of 20 hr., but it is conceded possible that the intensity of the light was not sufficient. With days of 14 hr. or less, aster seedlings simply formed a rosette of leaves and developed no stems until the days lengthened. Flowers developed under photoperiods of 14± hr., but the most rapid development of buds occurred during the shorter days. All varieties responded to varying day lengths as typical short-day plants even though they flowered under any length of day supplied.

Reduction of daylight period on asters, A. LAURIE and E. W. MCELWEE (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 615, 616*).—Observations by the Ohio Experiment Station on several varieties of annual garden asters showed that covering the plants with black sateen cloth from 5 p. m. to 7 a. m., beginning about 7 weeks after planting on May 15 and lasting until the color showed in the buds, resulted in optimum size and number of blooms and lengths of stems.

Effect of day length on bud formation noted in Cornell tests, K. POST (*Florists' Rev., 77 (1935), No. 1987, pp. 10–12, figs. 2*).—This is a summary of work on chrysanthemums at Cornell University, discussing market conditions, the need for late blooms, the importance of day lengths, calculating dates, delaying blooms, after-dormancy, and general and lighting recommendations.

Some factors affecting flower bud initiation and development in the chrysanthemum (C. morifolium), K. POST (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 623–625*).—Using the variety Major Bonnafon, which exhibits a tendency to blindness more frequently than other greenhouse varieties, high concentrations of nitrogen were not found at Cornell University to influence the

formation of blind growth, nor did other factors, such as spacing or excessive hardening, have any influence. There was some indication that tarnished plant bugs, and in some cases late propagation and low pinching, are causal factors. Propagation of blind stock of the Natick variety did not yield blind progeny.

Speeding up flowering in the daffodil and the bulbous iris, D. GRIFFITHS (*U. S. Dept. Agr. Circ. 367 (1936), pp. 18, pls. 5*).—Cold storage of narcissus bulbs throughout their entire storage season resulted in a decided acceleration of flowering, accompanied by severe dwarfing. Complete inhibition of growth in the early trumpet varieties was reached at about 36° F. Varieties differed in their response to low temperature, the King Alfred, for example, being more susceptible to injury than Victoria. Moderate temperatures (around 50°) during the last month of the narcissus storage period accelerated flowering by 3 or 4 weeks without detrimental dwarfing. Warm storage until August followed by a constant temperature of 50° up to potting time is considered good practice. Warm storage was manifestly necessary to promote the development of the blossom buds within the bulbs. Cold treatment late in the season resulted in shortening the time required to bring bulbs into bloom by several months when potting was done early. Bulbs for potting after December 1 should, after the initial warm storage, be held dry at 40° to 55° up to the time of planting. Warm storage during this period apparently retarded flowering.

The place that narcissuses are grown was found to be a factor in their flowering, since the earlier the bulbs were dug the earlier they could be brought into flower. Digging bulbs from 2 to 3 weeks before full maturity resulted in some acceleration to flowering but with some loss in growth and firmness. The possibility of producing high-grade narcissus bulbs in cool regions and transferring them to warm localities for one season in order to gain a measure of earliness is suggested.

Methods of handling narcissus bulbs for forcing in vases of water are described. Some observations on Dutch and Spanish iris indicated that these bulbs react to a 50° temperature during the month of August very much as does the narcissus. The irises were benefited by a preliminary heat treatment of 80° from digging time to August.

Controlling the color of greenhouse hydrangeas (Hydrangea macrophylla) by soil treatments with aluminum sulphate and other materials, R. C. ALLEN (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 632–634*).—Of several materials, such as aluminum sulfate, powdered sulfur, peat moss, ferrous sulfate, copper sulfate, magnesium sulfate, and manganous sulfate, tested at Cornell University as amendments to the potting soil, none gave consistently good results in controlling the color of hydrangea flowers (Niedersachsen variety). Aluminum sulfate gave the best results, but it was difficult to determine how much to use. Much better results were secured with aluminum sulfate solution applied at weekly intervals during the forcing period. For plants in 5-in. pots five applications of 200 cc of 2.5 percent aluminum sulfate solution were effective in producing blue blossoms. Too many applications caused root injury and dwarfing.

The forcing of paper white narcissus bulbs after storage at various temperatures, T. M. WHITEMAN, R. C. WRIGHT, and D. GRIFFITHS (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 645–650*).—In experiments at Arlington Experiment Farm, Va., with bulbs stored at various temperatures and humidities prior to forcing, there was observed no evidence that submitting the bulbs to low temperature had any advantage except to advance blooming somewhat, but at the hazard of sacrificing quality. In 1933 bulbs held continuously at 80° F. from August to placing in the soil for forcing produced slightly better results

than any other lot. The 50° lot was all ready for cutting within 4 to 6 days, while 9 to 16 days were required for some of the other treatments.

Rose seeds: Their after-ripening and germination, M. A. H. TINCKER *(Jour. Roy. Hort. Soc., 60 (1935), No. 9, pp. 399–417, pls. 6).*—Recording the fact that slow germination of rose seeds has been recognized for centuries, the author discusses the results of experiments in the Wisley Gardens in which seeds of many different species of *Rosa* treated in different ways were tested for viability. Of the various methods, which included cutting of the pericarp, increasing oxygen supply, dry storage at several temperatures, and stratification in cool, moist sand, only the last gave consistently beneficial results. Fluctuations in temperature and water content appeared necessary; for example, prolonged enclosure in ice failed to cause rapid germination. In conclusion the author advises that some acceleration in the germination of rose seeds may result from storage in moist sand or other medium at temperatures of from −2° to +2° C.

Temperature as a factor in bud differentiation and flowering of stocks (Matthiola incana), K. POST *(Amer. Soc. Hort. Sci. Proc., 31 (1934), p. 631).*—Stocks grown at varying temperatures in the greenhouses of Cornell University failed to differentiate flower buds when the temperature was held above 60° F. This failure to form buds is frequently known as blindness and is associated with the biennial reaction of stocks grown under conditions of high temperature.

FORESTRY

Possibilities of shelterbelt planting in the Plains region *(U. S. Dept. Agr., Forest Serv., 1935, pp. III+201, pls. 6, figs. 100).*—This monograph, prepared under the direction of the Lake States Forest Experiment Station, includes the following papers: The Problem, by F. A. Silcox (pp. 1, 2); What the Study Discloses, by R. Zon (pp. 3–10); The Shelterbelt Zone: A Brief Geographic Description, by F. A. Hayes (pp. 11–14); The Proposed Tree Plantations—Their Establishment and Management, by D. S. Olson and J. H. Stoeckeler (pp. 15–27); Land Acquisition, by L. F. Kneipp and A. A. Simpson (pp. 29–32); Prospective Effects of the Tree-Planting Program, by R. Zon (pp. 33–38); A Survey of Past Plantings (pp. 39–47); A Review of Early Tree-Planting Activities in the Plains Region, by J. H. Hatton (pp. 51–57); Shelterbelt Experience in Other Lands, by P. O. Rudolf and S. R. Gevorkiantz (pp. 59–76); Economic and Social Aspects of Agriculture in the Plains Region, by M. L. Wilson (pp. 77–82); Climatic Characteristics of the Plains Region, by C. G. Bates (pp. 83–110); Soil and Forest Relationships of the Shelterbelt Zone, by F. A. Hayes and J. H. Stoeckeler (pp. 111–153); Native Vegetation of the Region, by J. M. Aikman (pp. 155–174); and Ground-Water Conditions of the Shelterbelt Zone, by G. E. Condra (pp. 175–196).

Why the prairies are treeless, G. A. PEARSON *(Jour. Forestry, 34 (1936), No. 4, pp. 405–408).*—Of various concepts advanced as to the reason for the absence of forest trees on the prairie, deficient precipitation and the inability of trees to cope with grass are considered most tenable. The author discusses older experiments in which trees were planted on grass sod, on clipped sod, and on soil from which the grass was removed. In all cases the denuded plats were most successful. The species of grass is said to be a factor, and moderate grazing favors young trees. Excessive grazing, on the other hand, was detrimental.

Drouth susceptibility of evergreen trees in Iowa, G. R. RAMSEY *(Jour. Forestry, 34 (1936), No. 4, pp. 424–429, fig. 1).*—Observations by the Iowa State

College on demonstrational windbreak plantings established in 1922 showed that evergreens were more effective, longer lived, and required less area than deciduous trees. The long drought of 1930–34 caused particular injury to Scotch and Norway pines. On the basis of survival during the dry winter of 1933–34, Douglas fir, western yellow pine, Austrian pine, and Black Hills and white spruces are recommended. Norway spruce, white cedar, and white and jack pines may thrive under certain favorable conditions. Among factors favoring evergreens are wide spacing, cultivation, protection from livestock and poultry, and the diversion of waters from the barnyard.

Effects of drought on oak forests, A. C. McIntyre and G. L. Schnur (*Pennsylvania Sta. Bul. 325 (1936), pp. 43, figs. 13*).—This study, prompted by the serious effects of the extreme drought of 1930, shows that in four forest types conifers on the whole suffered greater losses than hardwoods, with the exception of the scarlet and black oaks. The three oaks, chestnut, red, and white, were the most drought-resistant species, and of the four forest types under observation the chestnut oak type showed the least losses, both in basal area and in number of trees. The authors suggest that the low percentage of conifers in the chestnut oak type may have been a factor. The chestnut oak was the only one of the four types not to be influenced in composition by drought. Crown class or degree of competition was found to be unimportant as a factor affecting losses from drought. Observations on reproduction showed the greatest losses in the hemlock type.

Attempts to correlate annual, radial, and height growth with precipitation showed a lack of consistency in response of annual growth to precipitation alone, with a tendency for conifers to lag 1 yr. in their radial growth as related to precipitation. On some sites red oak also exhibited this lag. Red oak was the most sensitive and pitch pine the least to precipitation. During a number of years the response of conifers was opposite to that of hardwoods. In height growth red and Scotch pines in plantations showed a marked tendency to lag 1 yr. behind precipitation, while a close correlation was evident in white pine. Under natural forest conditions white pine showed a tendency to lag on three or four plats under observation.

Amount and distribution of moisture in a living shortleaf pine, B. J. Huckenpahler (*Jour. Forestry, 34 (1936), No. 4, pp. 399–401, fig. 1*).—Data taken on freshly cut trees of about 5.5 in. diameter at breast height and 30 ft. tall with well formed crowns showed that the moisture content of the entire cross section increases regularly in an upward direction until at the top it is twice that of the base. As to tissues, the phloem was remarkably uniform in moisture from base to top. The two outer rings showed a consistent rise in moisture from the soil level upward. The center of the trees appeared most variable of all parts, being higher in moisture content at the base than the two outer rings and increasing steadily to the midstem, where the moisture content dropped abruptly below the outer layers. At the base of the tree there was a larger proportion of moist outer xylem, while above the middle the pith and drier center rings comprised the greatest proportion of the sample.

New and noteworthy trees in Texas and Mexico, C. H. Mueller (*Bul. Torrey Bot. Club, 63 (1936), No. 3, pp. 147–155*).—Six new species, one new variety, six new forms, and one new section of *Quercus*, and one new species of *Ulmus* are described.

[Forestry studies by the Ohio Station] (*Ohio Sta. Bul. 561 (1936), pp. 107–118, figs. 2*).—Herein are included observations on reforestation activities, distribution of nursery stock, and studies of different strains of Scotch pine, by

E. Secrest; development of recreational and water control facilities, by O. A. Alderman; forest fire control, by B. E. Leete; and land classification, by R. R. Paton.

DISEASES OF PLANTS

Some aspects of plant pathology, F. T. Brooks (*Brit. Assoc. Adv. Sci. Rpt., 105 (1935), Sect. K, pp. 169–188*).—This address of the president of the section on botany reviews the subject mainly along the following lines: The notable recent advances in the control of plant diseases, the mutual relations between parasitic micro-organisms and their hosts, the relation of environment to epidemics, storage diseases, biological forms of fungi and their origin, stability and host-parasite relations, and the influence of one micro-organism on another in the establishment of disease. Recent studies of fungus, bacterial, virus, and physiological diseases are included, and bibliographic footnotes are given.

The relation between disease and the constitution and environment of the tree, W. R. Day (*Jour. Roy. Agr. Soc. England, 95 (1934), pp. 54–72*).—In this general discussion the author has attempted to show that there exists an intimate relationship between the constitution of the tree, the environment in which it lives, and the development of disease.

Bacterial diseases of plants, A. A. Iachevskiĭ (Jaczewski), revised and enlarged by N. A. Naumova (Naumov) (*Bakteriozy rastenii. Moskva: Gosud. Izdatel., 1935, pp. VIII+712, figs. 120*).—This is a posthumous work, revised and enlarged by N. A. Naumova.

An investigation of the viability of fungal spores and bacteria in the contents of a sealed canopic jar (circa 1800 B. C.), H. Dickson (*Jour. Bot. [London], 74 (1936), No. 877, pp. 13–17, fig. 1*).—On the basis of experimental data it is concluded that the jar examined had been hermetically sealed, that the three organisms obtained (*Aspergillus, Penicillium,* and *Micrococcus*) were contaminants, that the contents of the jar were not inhibitory to spore survival, and that there was nothing alive in the jar before it was opened.

Investigations on the wound-parasitism of certain Fusaria, A. Mitra (*Indian Jour. Agr. Sci., 5 (1935), No. 5, pp. 632–637, pl. 1*).—Apple fruits of the Kashmir and Hill varieties inoculated in the interior (after removal of a plug, with subsequent replacement and sealing of the surface—all under sterile conditions) with *Fusarium moniliforme, F. viride* (*F. solani medium*), *F. camptoceras, F. semitectum,* and *F. incarnatum* (*F. semitectum majus*) averaged about 22 percent of injury by rot from the first and about 1.5 percent from the second, but developed no rot at all from the others. Using *F. diversisporum* and the five species named above, potatoes were inoculated by a slightly modified sterile-plug procedure, with the result that *F. viride* caused a dry rot and the others left the tubers undamaged. Saltants of *F. semitectum* and *F. viride* gave the same results on potatoes as their respective parent strains.

So far as the author is aware, this is the first published record of the wound parasitism of *F. moniliforme* and *F. viride* on apples and potatoes, respectively.

Studies on the biology of Gymnosporangium globosum Farl., J. D. MacLachlan (*Jour. Arnold Arboretum, 17 (1936), No. 1, pp. 1–25, pls. 10, figs. 2*).—*G. globosum* (the taxonomy and synonomy of which is discussed) is confined to the eastern and central parts of the United States and to the southern parts of Ontario and Quebec, where its increasing prevalence in localized areas (particularly eastern New York) is causing great damage to ornamental and or-

chard trees. The diseases caused by it occur on at least 10 genera of pomaceous plants and on at least 3 species of *Juniperus*. The symptoms induced on the foliage and to a lesser extent on the flowers, fruit, and twigs of the pomaceous hosts and on the foliage and twigs of the *Juniperus* hosts are described and illustrated.

The age of the teliospores, basidiospores, and aeciospores and the temperature to which they are subjected are shown to have marked effects on the percentage germination. The amount of water present also modifies the percentage germination as well as the type of germ tubes developed.

The evidence indicated that infection of the red cedar occurs primarily in the late fall, and that it takes place through the upper, stomatal surfaces of the leaves.

Monograph on the European Polyporaceae, with special reference to their agricultural relations.—II, Grifola and Phaeolus [trans. title], A. PILÁT (*Bot. Centbl., Beihefte, 52 (1934), Abt. B, No. 1, pp. 23–95. pls. 14, figs. 11*).—Eight new combinations and one new form of *Grifola* and one new combination of *Phaeolus* are included.

Further serological studies of plant viruses, J. M. BIRKELAND (*Ann. Appl. Biol., 22 (1935), No. 4, pp. 719–727*).—"Precipitin reactions with several plant viruses propagated in serologically unrelated hosts offer additional evidence that the virus is, in itself, antigenic. Reciprocal precipitin tests show that the viruses of cucumber mosaic, tobacco ring spot, and tobacco mosaic are serologically distinct; whereas tobacco mosaic virus, aucuba mosaic virus (green and yellow strains), and probably tomato streak virus remain serologically indistinguishable. No soluble specific substance was isolated from the juice of virus-diseased plants or of healthy tomato by the methods employed."

Serological studies of plant viruses, J. M. BIRKELAND (*Bot. Gaz., 95 (1934), No. 3, pp. 419–436*).—Besides the antigens of normal plants, the juice from virus-infected plants was found to contain an antigenic fraction which could not, by the methods used, be separated from the virus itself. This was true for Tobacco Virus 1 whether developed in tobacco or tomato. This factor was also specific in that antibodies induced by one virus differed qualitatively from those induced by others. A new method, using a Seitz filter, for freeing viruses from the antigenic constituents of healthy plants is described. However, regardless of the method used, it appeared impossible to separate the virus from the specific antigenic factor accompanying it. Close association of this factor with infectivity and the specific nature of the antigenic fractions accompanying the different viruses strongly suggest that this specific antigenic factor is either the virus itself or a virus-plant protein complex in which the virus plays the role of haptene. Whatever the mechanism of the specificity of the reaction may be, it is apparently specific for the virus, and, therefore, the precipitation test should prove valuable in the classification of plant viruses.

The effect of environment on the production of primary lesions by plant viruses, R. J. BEST (*Jour. Austral. Inst. Agr. Sci., 1 (1935), No. 4, pp. 159–161*).—In the author's studies of the viruses of tomato spotted wilt and ordinary tobacco mosaic, "the idea that a minimum or critical infective unit (possibly amounting to some millions of virus particles) is necessary for the production of a single visible necrotic lesion, and the variability of this minimum unit with environmental conditions and also from leaf to leaf and from part to part of the same leaf, is being developed. The tendency of primary lesions to form in greatest number near the lateral veins points to the critical infective unit being smaller in the neighborhood of the vascular system."

A microscopical study of infection of the roots of strawberry and tobacco seedlings by micro-organisms of the soil, A. A. HILDEBRAND and L. W. KOCH (*Canad. Jour. Res., 14 (1936), No. 1, Sect. C, pp. 11–26, pls. 3, fig. 1*).—"Similarity of organisms encountered in studies of black root of strawberry and of tobacco, respectively, carried out contemporaneously but independently, suggested the cooperative investigation, the results of which are embodied in this paper. Strawberry and tobacco seedlings growing (1) in seedbed muck heavily infested with *Thielaviopsis basicola* (Berk.) Ferraris and other organisms known to be pathogenic on tobacco, (2) in soil from a commercial plantation where strawberry root rot had occurred in severe and typical form, and (3) in greenhouse compost soil were examined microscopically daily, commencing a few hours after germination and continuing throughout a period of 4 weeks. Organisms observed definitely within root tissues of both hosts included the 'phycomycetous mycorrhizal' fungus *T. basicola* (observed in plants grown in muck only), *Rhizoctonia* (*Solani* and endophytic orchid types), forms of *Pythium*, *Asterocystis* (*Olpidiaster*), certain unidentified fungi, a minute filamentous alga, and nematodes. Organisms observed on the surface of roots included representatives of the genera *Cylindrocarpon* (*Ramularia*), *Fusarium*, *Helminthosporium*, *Sphaeropsis*, and *Cephalothecium*. The sequence of appearance, percentage occurrence, and parasitic capabilities of certain of the organisms varied in roots grown in the different soils. Because of early infection by, and ultimate, almost universal occurrence of, the phycomycetous mycorrhizal fungus, this organism received especial attention. Evidence based on certain morphological differences suggests the occurrence of strains of this organism. Of interest, too, is an alga invading living root tissue.

"From observations not limited alone to the examination of diseased roots of strawberry and tobacco, the authors are led to conclude, (1) that root rot as it occurs in nature is extremely complex even in cases where a primary causal agent is recognized, and (2) that fungi representative of comparatively few groups or genera are 'common factors' in root rot complexes of different host plants.

"The technique described offers distinct advantages in that it permits a study of the sequence and severity of infection by the organisms involved in a root rot complex; it reveals the occurrence of obligate parasites, the presence of which would never be detected by the soil-plating, the Cholodny, or the tissue-isolation methods; and it is readily adaptable to the study of other root rot complexes."

Spray injury and spray practices to avoid it, J. M. HAMILTON (*N. Y. State Hort. Soc. Proc., 80 (1935), pp. 185–190*).—This is a contribution from the New York State Experiment Station.

Investigations of the injurious effects of copper-containing spray materials [trans. title], K. C. MENZEL (*Angew. Bot., 17 (1935), No. 4, pp. 225–253, figs. 8*).—In all the plant species studied (*Pelargonium*, *Impatiens*, *Symphoricarpus*, *Lonicera*, apple, and pear), injuries by copper-containing sprays showed the same external picture. The higher the absorptive power of a plant, the less was its sensitivity to copper sprays. Artificial manuring altered the absorptive power of the plants, usually raising it, and in a parallel way the sensitivity to copper sprays became altered, i. e., the manured plants were less susceptible to copper spray injury than the unmanured plants.

Not only the osmotic power, but also the leaf structure, played a role in sensitivity to copper. Corresponding to differences in leaf structure, nonbearing orchard trees were more sensitive to copper injury than bearing trees of the

same varieties. Copper-sprayed leaves wilted more slowly and transpired less than nonsprayed leaves. The chlorophyll in the copper-sprayed leaves was less soluble than that in the nonsprayed leaves.

The action of the copper-containing sprays was the same whether copper sulfate, copper chloride, or copper acetate preparations were used, but the extent of the injury probably varies with the different compounds.

The relative efficiency of fungicides, R. H. HUBT (*Va. Fruit, 24 (1936), No. 1, pp. 127–131*).—This is a popular summary from the Virginia Experiment Station.

Investigations of the influence of boron on the resistance of plants to parasitic attack [trans. title], R. GIGANTE (*Bol. R. Staz. Patol. Veg. [Roma], n. ser., 15 (1935), No. 3, pp. 471–483, fig. 1; Eng. abs., pp. 481, 482*).—In greenhouse pot tests with *Puccinia triticina* and in field tests with *P. glumarum*, additions of sodium borate to the soil not only increased the resistance of the wheat to these fungi but also had a stimulating effect on the growth of the plants.

The Plant Disease Reporter, April 15 and May 1, 1936 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 20 (1936), Nos. 7, pp. 120–131, figs. 3; 8, pp. 132–140*).—Among other things, these issues contain notes on the following subjects:

No. 7.—Additional records of Alaskan fungi (38 of the 71 not having been reported in any previous list), by E. K. Cash; occurrence of English mosaic on red raspberry in Oregon, by S. M. Zeller and G. L. Slate; *Verticillium* from snapdragon, watermelon, celery, and cowpea, by B. A. Rudolph and W. C. Snyder; poor germination of cottonseed in Georgia, by H. W. Rankin; *Phomopsis* canker of gardenia in Nebraska, by R. W. Goss; and powdery mildew on petunia in West Virginia, by J. A. Stevenson.

No. 8.—An epiphytotic of bean rust (*Uromyces phaseoli*) in Florida, by G. R. Townsend and W. B. Tisdale; pink rot (*Sclerotinia sclerotiorum*) of celery in Florida, by W. B. Tisdale and D. G. A. Kelbert; prominent appearance of downy mildew (blue mold) on tobacco in North Carolina, by L. Shaw; winter injury to peach and apple trees in Kentucky, by W. D. Valleau; phony peach disease under control; and overwintering of stem rust (*Puccinia graminis*), by E. C. Stakman.

[Phytopathological studies by the New Haven Station] (*Connecticut [New Haven] Sta. Bul. 381 (1936), pp. 167, 168, 174–179, 185, 186, 194, 195*).—Progress reports are given on the following matters under study: Control of the Dutch elm disease; late blight (*Phytophthora infestans*) of tomato; sand culture in the control of damping-off (*Rhizoctonia and Pythium*) of seedlings in greenhouses; potato yield increases from spraying with bordeaux mixture; a potato variety resistant to blight, drought, and tipburn; lime and calcium cyanamide in the control of clubroot of crucifers; slip seeding of sweetpotatoes for disease control; the "X" disease of peach; chestnut blight; apple spray tests for disease and insect control; control of gray mold (*Botrytis*) on strawberries; State survey of plant diseases (including new hosts for fungus and other diseases); white pine blister rust control; and, at the Tobacco Substation, diseases of tobacco (wildfire incidence, pole rot and dead blossom leaf spot in relation to *Alternaria tenuis*, and the incidence of *Pythium* rot of transplants).

Plant disease survey of economic crops for 1933, J. F. ADAMS (*Del. State Bd. Agr. Quart. Bul., 24 (1934), No. 1, pp. 7–15, fig. 1*).—This survey for Delaware covers orchard and small fruits (including the spore discharge periods for apple scab during 1933), field and vegetable crops, cereal and forage crops, and ornamentals.

Report of the plant pathologist for 1933, J. F. ADAMS (*Del. State Bd. Agr. Quart. Bul., 2¼ (1934), No. 1, pp. 3–6*).—This contribution from the Delaware State Board of Agriculture in cooperation with the Delaware Experiment Station and the U. S. Department of Agriculture reports briefly the scope of the work in the State on plant diseases during 1933.

[Phytopathological studies by the Maine Station] (*Maine Sta. Bul. 380 (1935), pp. 162–168, 169–172, 212–214, 220–224, 225, 226, 253, fig. 1*).—Progress reports are given on studies of virus diseases of potatoes in cooperation with the U. S. D. A. Bureau of Plant Industry (including the nature of virus diseases, by E. S. Schultz, W. P. Raleigh, and R. Bonde; mosaic in Green Mountain seed plats, by D. Folsom; insects in relation to the transmission of virus diseases of potatoes, by G. W. Simpson; and comparison of *Myzus persicae* and *Aphis abbreviata* regarding transmission of mild mosaic, leaf roll, and spindle tuber, by Schultz, Raleigh, and Bonde); losses due to seed piece decay and blackleg, by Bonde; seed treatment for *Rhizoctonia* control, by Raleigh and Bonde, in cooperation with the U. S. D. A. Bureau of Plant Industry; apple scab control on young and on 22-year-old McIntosh trees, by Folsom; blueberry diseases and their control and bacterial wilt of corn, both by F. L. Markin; and breeding cucumbers resistant to scab (*Cladosporium cucumerinum*), by R. M. Bailey and I. M. Burgess (E. S. R., 74, p. 340).

[Phytopathological studies by the Ohio Station] (*Ohio Sta. Bul. 561 (1936), pp. 35–38, 39, 40–42, 118, 119*).—Progress reports are given of the following studies: Apple scab control by wettable sulfurs, the etiology of apple measles, spraying for apple bitter rot, apple black rot or frogeye disease, and the distribution and control of the Dutch elm disease, all by H. C. Young; "insoluble" copper compounds as fungicides, by J. D. Wilson; the relative stability of formaldehyde dust prepared with different carriers, by Young and Wilson; tomato spray tests in 1935, by Wilson and H. A. Runnels; the resistance of snap beans to bacterial blights, by Wilson; potato spray tests, fasciation of sweet peas (due to *Phytomonas fascians* n. sp.), and the effect of temperature and H-ion concentration on spore germination and growth of *Sclerotinia fructicola* and *Fomes annosus*, all by P. E. Tilford; progress in the development of a new tomato variety resistant to leaf mold, by L. J. Alexander; the bacteriophage of *Aplanobacter stewarti* [=*P. stewartii*] of corn wilt and its distribution, by R. C. Thomas; a new peach disease (cause undetermined), by H. F. Winter; and white pine blister rust control, by [O. J.] Dowd.

Report of the botanical and mycological division for the year 1934, E. B. MARTYN (*Brit. Guiana Dept. Agr., Div. Rpts., 1934, pp. 105–108*).—Most of the report is given to observations on diseases of major crops (sugarcane, rice, coffee, and coconuts) and of minor crops (citrus, plantains, bananas, cacao, pineapples, guavas, tomatoes, and breadfruit.

The first meeting of the phytopathologists of Brazil (A. S. MÜLLER (*Science, 83 (1936), No. 2150, p. 253*).—This is a brief note on the meeting held in Rio de Janeiro, January 20–25, 1936, including the general program and future plans.

India: New diseases of crops during the year 1934–1935 in Burma, U. T. SU ([*Internatl. Rev. Agr.*], *Internatl. Bul. Plant Protect., 9 (1935), No. 12, p. 273*).—Diseases of nine hosts are listed, including *Puccinia glumarum* on *Triticum* sp., *Penicillium digitatum* on *Citrus aurantium*, *Macrosporium parasiticum* on *Allium* sp., and *Choanephora cucurbitarum* on *Capsicum annuum*.

Australia: Notes on plant diseases recorded in New South Wales for the year ending 30th June 1935, R. J. NOBLE ([*Internatl. Rev. Agr.*], *Internatl. Bul. Plant Protect., 9 (1935), No. 12, pp. 270–273*).—This includes brief summaries of the incidence of diseases of cereals and other field crops and of fruit, vegetable, and miscellaneous plants.

Reports and experiences on the direct control of cereal rusts in 1935 [trans. title], C. SIBILIA (*Bol. R. Staz. Patol. Veg. [Roma], n. ser., 15 (1935), No. 3, pp. 484–489*).—This is a summary of practical results in Italy.

Studies on the nature of rust resistance in wheat, V–VII (*Canad. Jour. Res., 4 (1931), No. 2, pp. 134–147; 11 (1934), No. 6, pp. 667–686, figs. 3; 14 (1936), No. 1, Sect. C, pp. 1–10*).—Continuing this series (E. S. R., 65, p. 346), the following additional studies have appeared:

V. *Physiology of the host*, W. F. Hanna.—"Determinations have been made of catalase, diastase, and oxidase activity; rate of respiration; and content of chlorophyll, xanthophyll, and carotene in the leaves of eight wheat varieties. With respect to their reactions to stem rust, these wheats vary from almost complete susceptibility in certain varieties to a high degree of resistance in others. Catalase activity increased as the plants approached maturity, whereas diastatic activity decreased with increasing age. No significant differences were found in the oxidase activity or respiratory rate of the varieties. Little Club and the varieties of the *vulgare* group proved to be relatively rich in chlorophyll and the carotenoids. It is suggested that photosynthetic processes may take place more rapidly in the cells of the varieties having a high content of these pigments, and thus furnish conditions suitable for the growth of the rust mycelium."

VI. *Effect of hydrogen ion concentration, phenolic compounds, and host extracts on the germination of urediniospores of Puccinia graminis tritici, form 21*, J. A. Anderson.—"Urediniospores of *P. graminis tritici*, f. 21, were sown on buffer solutions covering the range from pH 3 to pH 8. Maximum germination was obtained between pH 5.8 and pH 6.5, with indications that if the point of maximum germination could be determined with precision it would be found to lie in the neighborhood of pH. 6.2.

"The effect of buffered and unbuffered solutions of pure phenolic compounds on the germination of urediniospores was studied. Greater inhibition was obtained with unbuffered solutions owing to the additional effect of H-ion concentration. In buffered solutions at pH 6.0, germination was prevented by 45 p. p. m. of hydroquinone, 125 of *o*-cresol, 180 of anisic acid, 250 of benzoic acid, 340 of catechol, 400 of guaiacol, and 600 of phenol. A number of other compounds were also studied. The inhibitory effects of compounds, of which the bactericidal effects are known, are fairly closely related to their bactericidal efficiency.

"Investigations were made of the inhibitory effects on spore germination and the growth of germ tubes, of aqueous dilutions of 15, 10, 5, and 2.5 percent of the press-juice of Vernal, Khapli, Marquis, and Little Club wheats. Statistical treatment of the data accumulated in 10 series of determinations, in which a total of 160,000 spores was counted, showed that significant differences occurred between varieties and that variations in the total solid content and H-ion concentration of the press-juice had no consistent effect upon the results. Although the results were not entirely clear-cut, it is concluded that the varieties fall in the following order with respect to increasing inhibitory effect of their extracts: Vernal, Marquis, Khapli, and Little Club. Since Vernal and Khapli are resistant to form 21, whereas Marquis and Little Club are susceptible, the

results fail to show any relationship between the effects of host extracts on the germination of urediniospores, or on the growth of germ tubes, and the rust resistance of the variety."

VII. *Chemical analyses of hybrid lines of wheat differing in their rust reactions.* J. A. Anderson.—"Four lots of wheat, representing the four possible combinations of seedling and mature-plant reaction to rust, were grown in the field, and leaves were collected at the seedling stage and after heading. The material was dried, ground, and analyzed for total ash; total nitrogen; fat; cold- and hot-water-soluble organic matter, ash, reducing compounds, reducing sugars, and invert sugar; alcohol-soluble matter; reducing compounds (from hemicelluloses) and nitrogen liberated by hydrochloric acid; reducing compounds (from cellulose) and nitrogen liberated by sulfuric acid; and for ash, protein, and lignin (by difference) in the remaining residue. The material was also subjected to quantitative extraction, with the following solvents in series: Ligroin, ether, chloroform, ethyl acetate, acetone, and ethyl alcohol.

"Small but significant differences in constitution were found between the wheat classes. There was no evidence that these differences in constitution were related to rust reaction."

The stem rust epidemic of 1935 in Nebraska, G. L. Peltier, M. Yount, and C. A. Suneson (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1936, Sup. 91, pp. 18, pl. 1, figs. 22*).—After surveys of the meteorological conditions of the season, of the relation of the weather to host development, and of the stem rust epidemic—"as severe as any previous epidemic in Nebraska"—it is concluded in this joint contribution by the Nebraska Experiment Station and the Bureaus of Plant Industry and Entomology and Plant Quarantine that, although stem rust took its toll of spring and winter wheats and barley, the hot, dry winds were responsible primarily for the poor filling of the heads and shriveled berries, while the losses in rye and oats were for the most part due to heat alone.

The primary source of the stem rust epidemic is said to have been the early development of a sufficiently large amount of inoculum in the south-central Nebraska and adjacent Kansas areas, as the result of perhaps larger numbers than usual of wind-blown spores from the South, to produce a heavy infection throughout most of Nebraska. Other contributing factors were a delayed seeding (spring wheat) or delayed early spring development (winter wheat), late heading and ripening, and a long fruiting period with favorable weather conditions for extensive infection about the time of heading of the winter grains.

No variety of spring or winter wheat commonly grown in the State exhibited resistance to the prevailing physiologic races.

Breeding rust-resistant spring wheats, L. R. Waldron and J. A. Clark (*Science, 83 (1936), No. 2144, pp. 106–108*).—This joint paper from the North Dakota Experiment Station and the U. S. D. A. Bureau of Plant Industry states that of the two methods of combating wheat rust—barberry eradication and breeding for resistance—the latter, after the lessons from the 1935 epidemic, must now be a major recourse. The history and results of such breeding work are briefly reviewed.

The examination of wheat seed to determine the disease factor, P. M. Simmonds and H. W. Mead (*Sci. Agr., 16 (1935), No. 4, pp. 175–179; Fr. abs., p. 179*).—"The literature dealing with the methods of examination of seed samples for the determination of seed-borne diseases is reviewed. Most of the methods proposed are discussed, especially in relation to the examination of

wheat seed samples. The results obtained with wheat seed samples collected in Saskatchewan show that a good indication of the disease factor may be determined by a systematic examination."

Two new rust-resistant, white-seeded Kentucky Wonder beans, L. L. HARTER (*Seed World, 39 (1936), No. 1, pp. 12, 13, fig. 1*).—This is a semipopular summary of studies involving the development and field testing of two varieties of stringless pole beans resistant to the more common of the two strains of bean rust.

Downy mildew of beetroot, a disease new to the State, C. J. MAGEE (*Agr. Gaz. N. S. Wales, 46 (1935), No. 10, pp. 571, 572, figs. 2*).—This report of the disease (*Peronospora schachtii*) near Sydney is apparently the first for New South Wales. Its symptoms, economic importance, transmission through the seed, and control are briefly discussed.

The value of disinfection of the seed balls of beets [trans. title] L. DECOUX, J. VANDERWAEREN, and G. ROLAND (*Sucr. Belge, 55 (1935), Nos. 7, pp. 130–134; 8, pp. 145–152*).—After briefly reviewing the seed disinfection tests against blackleg (*Phoma betae*) of beets as reported in various countries, the authors state that the rather conflicting results are probably due to differences in climatic conditions. In the authors' experiments (1932, 1934) in Belgium, Germisan, Tutan, and water are reported to have had a favorable influence, particularly on the germinating power, while soaking and humidification, in addition, increased the yields.

Overwintering of Aplanobacter stewarti, C. ELLIOTT and F. W. POOS (*Science, 80 (1934), No. 2074, pp 289, 290*).—This note records data on the harboring of *A. stewarti* in overwintering adults of the flea beetle *Chaetocnema pulicaria*.

Dissemination of bacterial wilt of corn, C. ELLIOTT (*Contrib. Iowa Corn Res. Inst.* [*Iowa Sta.*], *1 (1935), No. 1, pp. 53–72, pls. 4*).—In this comprehensive and critical summary covering more than 35 yr. of intermittent outbreaks of corn wilt and culminating in the unprecedented epidemics of 1932–33, the author reviews some of the published work of this period and traces briefly what we know regarding the history and development of the disease. The varietal and environmental relations are stressed and particular emphasis is given to the role of insects as vectors. The results by previous workers relative to transmission by flea beetles (E. S. R., 69, p. 669) are confirmed and extended to include proof of the overwintering of *Aplanobacter stewarti* [=*Phytomonas stewartii*] within the body of the flea beetle (*Chaetocnema pulicaria*) (E. S. R., 73, p. 325 and above). The correlation of high winter temperatures with following high incidence of the disease and its probable relation to temperature effects on the vectors are noted. Finally, data on natural and artificial infection of a new host, teosinte (*Euchlaena mexicana*), are presented.

Relation of rate of planting to the effect of corn seed treatment, C. S. REDDY (*Contrib. Iowa Corn Res. Inst.* [*Iowa Sta.*], *1 (1935), No. 1, pp. 119–130, figs. 3*).—Seed treatment tests were conducted at the station (1930–34), including nearly disease-free, *Diplodia*-infected and at times *Basisporium*-infected, and *Gibberella*-infected seed corn. Treated and untreated seeds planted at four rates were compared in natural and thinned stands. There were in all 522 paired, 4-row plats 12 hills long, of which only the 2 middle rows were used. These comparisons indicated that artificial thinning may injure yields, thus introducing an uncontrolled factor. In the plats from *Diplodia*-infected seeds the treated plats were handicapped in performance by thinning.

The seasons were in the main favorable for corn both at planting time and during maturity, thus being conducive to the smallest possible benefits

from the seed treatments. These benefits were greater in comparisons with field stands less than the most productive ones (4.4, 3.3, 2.7, and 1.1 bu. per acre) than with stands greater than the most productive ones (2.5, —1.3, 1.9, and —0.7 bu. per acre). These latter differeneces showed two mathematically significant increases and no significant decreases, indicating that the plants from treated diseased seed were more productive than those from untreated diseased seeds. These results were within stands where an increase in stand should have produced a decreased yield, and hence the increased yields could not have come from increases in the stands.

"Seed treatment killed, inhibited, or delayed the action of the seed-borne parasite, so that plants from treated *Diplodia*- or *Gibberella*-infected seed outyielded plants from similarly diseased seed not treated, and these data strongly indicate that corn seed treatment was not limited to its effects on field stands."

Preliminary studies on the effect of filtrates from cultures of Diplodia zeae upon seedling blight of maize, G. L. McNew (*Contrib. Iowa Corn Res. Inst.* [*Iowa Sta.*], *1 (1935), No. 1, pp. 73–79*).—Through these studies at the station it was found that corn seedlings from seeds severely infected with *D. zeae* suffered less from seedling blight when the seeds had been previously immersed in a culture filtrate of the pathogen. This property of the filtrate seemed to be independent of the character of the culture medium, but the fungus must have passed the active growing period for its filtrate to be effective. The influence of the filtrate on emergence was pronounced at 16° C., where the plant was at a disadvantage with the pathogen, but was very slight at higher temperatures. The filtrate did not prevent blight by the stimulating of abnormally rapid growth of the plant or by absolutely preventing growth of the fungus. The filtrate generally contained a mixture of materials, and the beneficial component proved to be thermostable and nonvolatile so that it could be partially purified and concentrated by distilling off the volatile, slightly toxic fraction.

Some new aspects of maize smut, G. N. Davis (*Contrib. Iowa Corn Res. Inst.* [*Iowa Sta.*], *1 (1935), No. 1, pp. 97–99*).—In this study by the station it was found that the lower the surface tension the greater were the numbers of plants infected and of smut galls produced. Since nodal infections usually become evident late in the season and often during periods of drought, it was believed that the mycelium may lie dormant in the nodal buds for long periods. Experiments indicated that nodal infections may occur when the plants are young and become evident only when the dormant buds become active. Nodal smut boils thus probably depend on factors tending to stimulate activity in the axillary buds, and these factors are very evident in dry years when there are more poorly pollinated ears resulting in excess food and bud stimulation.

Researches on corn smut (Ustilago zeae) [trans. title], G. Borzini (*Bol. R. Staz. Patol. Veg.* [*Roma*], *n. ser., 15 (1935), No. 3, pp. 389–423, figs. 5*).—The author here presents experimental data on spore germination in various media, the behavior of the chlamydospores when buried from summer to spring at various depths in the soil (the effects of the soil cover, soil humidity, soil surface v. depth, and of the solar rays), the susceptibility of the maize plant sown in the open field in soil artificially infected with spores during the preceding season and in an isolated environment in artificially infected soil, and the progress of spontaneous smut infection in plants heavily manured with calcium cyanamide or kainite.

A note on a survey of the disease of malformation in the Punjab-American cottons, M. Afzal, S. S. Jaggi, and B. Singh (*Indian Jour. Agr.*

Sci., 5 (1935), No. 5, pp. 624–631).—In the cotton belt of the Punjab this disease is reported as serious only in the vicinity of the Agricultural College estate at Lyallpur. It attacks primarily the American varieties of cotton, starting when the plants are about a month old and becoming very active during August and early September. Plants attacked while young remain much stunted and bear very few small bolls or none at all. The disease spreads upward in the plant fairly regularly from the incipient focus, but sometimes a few branches escape the effects. It is shown to be nonhereditary, but whether it is of physiological or virus nature has not yet been definitely determined. The bearing of soil conditions on the disease is also obscure. Four other species of crop plants with similar symptoms were observed, viz, two species of *Phaseolus* and one each of *Dolichos* and *Capsicum*.

Flax chlorosis in relation to iron and manganese [trans. title], W. SCHOLZ (*Ztschr. Pflanzenernahr., Dungung u. Bodenk., 34 (1934), No. 5–6, A, pp. 296–311*).—Flax was grown in acid-washed sand with various combinations of $CaCO_3$, $Fe_2(SO_4)_3$, $MnCl_2$, and $MgCl_2$. The chlorosis associated with high $CaCO_3$ was due to deficiency of iron and could be cured in early growth by iron salts. The mobility of iron in the plant is probably low, and under iron deficiency flax is unprotected against an excess of calcium. Manganese proved to be definitely injurious, and magnesium did not appear to lessen this injury. The chlorosis was not lessened by manganese, which appeared to restrict the absorption of calcium and iron.—(*Courtesy Biol. Abs.*)

Life-history of gram blight (Ascochyta rabiei (Pass.) Lab.=Phyllosticta rabiei (Pass.) Trot. on gram (Cicer arietinum L.)) and its control in the Punjab, J. C. LUTHRA, A. SATTAR, and K. S. BEDI (*Agr. and Livestock in India, 5 (1935), No. 5, pp. 489–498, pls. 3*).—The disease, the symptoms of which are described, is shown to be due to *A. rabiei*, whose cardinal points for growth and spore germination are 32.5°, 20°, and 10° C. The disease is carried over by infected seed and plant debris, and it spreads from plant to plant and from field to field during the growing season by spores and infected plant parts. The spores are not wind-blown in dry weather, but are carried by wind-blown rain. The environmental conditions influencing the disease during the growing season are discussed, and measures for its control are recommended.

Gram-wilts in the Central Provinces, J. F. DASTUR (*Agr. and Livestock in India, 5 (1935), No. 6, pp. 615–627, pls. 4, figs. 3*).—The author presents observational and field experimental data relative to two wilt diseases of gram or chickpea (*Cicer arietinum*), one of which is due to *Rhizoctonia bataticola* and the other probably to unfavorable soil conditions.

The chlorotic disease of the hop.—IV, Transmission by seed, E. S. SALMON and W. M. WARE (*Ann. Appl. Biol., 22 (1935), No. 4, pp. 728–730, pl. 1*).—"In 228 seedlings raised from hop plants affected with chlorotic disease, transmission of the disease occurred in 28 plants (12.3 percent) in the first year, and of the remaining 196 healthy seedlings 33 plants (16.8 percent) showed the disease in the second year. Thus, of the 228 seedlings raised, 61 (26.8 percent) eventually showed chlorotic symptoms. In the authors' opinion, transmission of the disease was through the seed."

A contribution to the physiology of the "lime chlorosis" of lupines [trans. title], H. SCHANDER (*Ber. Deut. Bot. Gesell., 53 (1935), No. 9, pp. 807–810*).—This is a preliminary contribution.

A study of some abnormalities occurring in certain potato varieties in Colorado, R. D. ANDERSON (*Colorado Sta. Tech. Bul. 16 (1936), pp. 52, figs. 21*).—Studies over a 2-yr. period are reported on certain abnormalities occurring principally in the Brown Beauty and Perfect Peachblow potato varieties and

confined principally to the San Luis Valley. The "wilding" form occurred on both these varieties, the "pearl" type and the "ragged giant hill" only in the Brown Beauty, and the "pinto" form in Perfect Peachblow. All these abnormalities are described and compared with virus diseases, mutations, and degenerate conditions of unknown origin as referred to in the literature.

Though the studies indicated that these abnormalities are probably not of virus origin, they were all transmitted through the tubers. Pearl type is considered as possibly a varietal mixture, but no definite conclusions could be drawn for the pinto except that it is believed not to be of virus origin. None of the abnormalities appeared to be due to mutations originating from variations in chromosome numbers, although it is believed possible that wildings, pearl type, and ragged giant hill may be due to chromosome aberrations. Asseyeva's periclinal chimera test (E. S. R., 58, p. 423) failed to give positive results for the three forms just named. Pearl type, wilding, and ragged giant hill plants produced more tubers per plant than normals of the same varieties. Normal Brown Beauty outyielded wilding and ragged giant hill but not pearl type of Brown Beauty, and normal Perfect Peachblow outyielded the wilding form of the same variety. Normals of both varieties produced more marketable tubers than the abnormal forms of these varieties, except for pearl type. All these abnormal forms were detrimental and should be rogued from fields containing them.

List of distinct potato viroses, D. FOLSOM and R. BONDE (*Amer. Potato Jour., 13 (1936), No. 1, pp. 14–16*).—This contribution from the Maine Experiment Station is an annotated list of 26 viruses, including the names and in some cases the probable synonyms, compiled mostly from the literature (10 titles cited).

On toxins of wilting, O. K. ELPIDINA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 3 (1935), No. 8, pp. 360–364*).—The author studied the toxic principle of a species of *Fusarium* causing wilt in potatoes in middle Asia. Extracts were made of cultures of the fungus in various media, and these were tested for toxicity by the wilting method and by interferometric measurements of permeability variations. Correlations of the relative toxicity of the various preparations with their chemical analyses indicated that those high in ammonia were most active as regards both permeability and wilting of clover, sweetclover, potato, and tomato plants. Further tests in which various factors were successively eliminated are believed to warrant the assumption that the toxic principle of the extracts was ammonia.

On the production of sclerotia by Rhizoctonia solani Kühn. in pure culture, L. E. TYNER and G. B. SANFORD (*Sci. Agr., 16 (1935), No. 4, pp. 197–207, pl. 1*).—Sclerotia were not produced in the absence of either phosphorus or nitrogen, and the optimum and minimum units were 31 and 7.5 p. p. m., and 360 and from 50 to 56 p. p. m., respectively. The minimum for potassium was about 2 p. p. m., but the optimum could not be determined. Sclerotia were somewhat curtailed at concentrations of magnesium below 20 p. p. m., but small amounts appeared beneficial for optimum growth of both mycelium and sclerotia. The omission of calcium affected neither sclerotial nor mycelial growth. Sulfur at 320 p. p. m. completely suppressed sclerotial, and reduced mycelial, growth.

At from pH 3 to 9 sclerotia were readily produced, the optimum being around pH 5.5. The optimum temperature for sclerotia was apparently between 18° and 21° C., and within this range the most favorable atmospheric humidity was above 60 percent. The irradiations from pitchblende induced an increase in sclerotia formation.

Powdery scab in Australia, A. C. FOSTER (*Amer. Potato Jour., 13 (1936), No. 1, pp. 12–14*).—This is a brief historical note on powdery scab, including quarantine data, in Australia and Tasmania.

What the plant pathologist can and ought to contribute to a potato improvement program, J. G. LEACH (*Amer. Potato Jour., 13 (1936), No. 2, pp. 31–38*).—This is a contribution from the Minnesota Experiment Station.

Influence of temperature and maturity on the incidence of sann-hemp and pigeon-pea wilt at Pusa, B. B. MUNDKUR (*Indian Jour. Agr. Sci., 5 (1935), No. 5, pp. 609–618, figs. 2*).—Weekly death records in the field, of plants infected with *Fusarium vasinfectum*, indicated that high soil temperatures (from 28° to 33° C.) favored wilt in sunn-hemp (*Crotalaria juncea*) and that low soil temperatures (from 17° to 29°) favored it in pigeonpea (*Cajanus indicus*). The stage of maturity also influenced the susceptibility, more plants of sunn-hemp dying in the earlier part and more of pigeonpea in the later part of the season. "The simple and multiple coefficients of correlation among the three variables, soil temperatures, maturity, and wilt incidence, gave significant values, indicating that the hypothesis is correct. It was further noted that the values of partial coefficient of correlation between wilt incidence and soil temperature, eliminating the effect of maturity, or between wilt incidence and maturity, eliminating the effect of soil temperature, were not significant, showing that the influence of soil temperatures and maturity was a combined one on these crops."

The pests and diseases of soybeans known up to the present time in Europe [trans. title], A. KORNFELD (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 45 (1935), No. 12, pp. 577–613, figs. 25*).—This paper includes weeds, diseases of physiological and of unknown origin, insect and other animal pests, and fungus and bacterial infections. Among the last, *Bacterium glycineum* [*Phytomonas glycinea*], *B. sojae* [*P. sojae*], and *Pseudomonas* [*phytomonas*] *phaseoli* are discussed.

A note on "brown heart", a new disease of swede, and its control, T. WHITEHEAD (*Welsh Jour. Agr., 11 (1935), pp. 235, 236*).—This disease in Great Britain, resembling "water core" of apples and believed to be due to some form of malnutrition, was controlled to a considerable degree by applying borax at the rate of 10 lb. per acre.

A new virus disease of the tomato, K. M. SMITH (*Ann. Appl. Biol., 22 (1935). No. 4, pp. 731–741, pls. 3*).—"A new virus disease of the tomato plant is described. An account is given of the symptoms produced on a variety of host plants, mostly in the Solanaceae. Some of the physical properties of the virus have been investigated and its particle size measured by ultrafiltration through Gradocol membranes. The size as measured by filtration in plant sap is approximately 17–25 mμ. The virus is compared with other viruses commonly affecting tomato and tobacco, and methods of differentiating them are discussed."

Spontaneous infection of *Datura* plants about one-half mile from the nearest tomatoes and the experimental greenhouses would favor the view that the disease is insect transmitted and harbored by some wild host plant.

The pathological relationship between the host and parasite in varieties and strains of watermelons resistant to Fusarium niveum E. F. S., J. J. WILSON (*Iowa Sta. Res. Bul. 195 (1936), pp. 105–152, figs. 12*).—At all stages of growth watermelon plants are liable to attack by *F. niveum* through the root tips and ruptures formed by new lateral roots. Epidermal cells of the zones of elongation and maturation from 2 to 6 mm back of the zone of meristematic activity were as readily penetrated as meristematic tissues at the tip. After

penetration, hyphae continued intracellularly through the cortical cells to the pericycle, where the massed mycelium broke down the endodermal cell walls and entered the xylem vessels. Entrance through ruptures by the lateral roots was accompanied by the formation of lesions, intracellular penetration of cortical and parenchymatous tissues, and disorganization of the endodermis by the massed hyphae, which then entered the xylem vessels.

Infection of seedlings at or shortly after germination, combined with favorable conditions for the fungus, led to rapid invasion of the xylem vessels in he primary root, accompanied by a high percentage of wilting. Older plants, repeatedly infected through young lateral roots, apparently succumbed from a series of internal pathological disturbances involving the accumulation of gumlike materials, tyloses, and mycelium in the xylem vessels, particularly those of the primary root. Gumlike materials and tyloses in the xylem of diseased plants seem to be produced by living host cells injured by products of the fungus. Older resistant plants seemingly withstood attacks often fatal to seed lings, apparently no well-developed defense mechanism having had time to develop and function in the early seedling stage. Surviving resistant plants in heavily infested fields had bands of gumlike material surrounding the older xylem near the center of the root axis, while the secondary xylem at the periphery of the stele remained unaffected. On the other hand, wilted susceptible plants were filled with gumlike materials throughout the primary root xylem. Neither resistant nor susceptible plants, grown in noninfested soils, had appreciable quantities of gumlike materials and tyloses in the primary root xylem.

Greenhouse indexing of resistant seedlings proved of value in the Iowa Belle and Pride of Muscatine varieties, but, with the inoculum dosage used, Iowa King selections failed to show measurable differences in resistance from the susceptible checks.

In 4 yr. of field studies on heavily infested soils resistant plants seemed more resistant with age, while susceptible checks continued to wilt throughout the season. Changes in air and soil temperatures and in precipitation retarded or accelerated wilting for from 1 to several days. However, irrespective of environment, there was an upward trend in the percentage of average daily wilt, which reached a maximum at from 23 to 39 days after planting in susceptible seedlings and at from 16 to 24 days in resistant seedlings.

Pride of Muscatine, Iowa King, and Iowa Belle proved suitable as stock for the transmission of resistance, the last being especially desirable. Backcrossing the F_1 hybrid (resistant × susceptible variety) to the resistant parent proved the most effective method of building up resistance from susceptible and resistant lines.

Fruit diseases of the past season, L. M. MASSEY (*N. Y. State Hort. Soc. Proc., 80 (1935), pp. 15–24*).—This summary from the [New York] Cornell Experiment Station is based largely on material from the Farm Bureau Spray Information Service and includes 1934 data for apples, stone fruits, pears, quinces, grapes, strawberries, and small-fruit diseases in western New York, the last by L. M. Cooley (New York State Experiment Station.)

The cedar apple rust and its control, I. H. CROWELL (*Natl. Shade Tree Conf. Proc., 11 (1935), pp. 80–83*).—This is a summary of the author's researches on the life history of *Gymnosporangium juniperi-virginianae*, the symptoms of infection on apple and red cedar, the hosts in the genera *Juniperus* and *Malus*, and on control measures. Practically all of the North American *Malus* spp. and the European *M. sylvestris* are reported to be susceptible. A list of the relative susceptibility of some 450 apple varieties has been published previously

(E. S. R., 73, p. 635). Of the fungicides tested, an especially fine colloidal sulfur (Linco Colloidal Sulfur) gave the best results, and from five to six applications are recommended.

The cedar rust and quince rust diseases of the apple, F. J. SCHNEIDERHAN (*Mountaineer Grower, 7 (1936), No. 71, pp. 7, 9–11, 13, 14, pl. 1*).—This contribution from the West Virginia Experiment Station records the increasingly serious losses by infection from the new crop of red cedars which has grown since the eradication campaign of 10 yr. ago. The general discussion emphasizes the facts connected with the life cycle of the cedar-rust fungus (*Gymnosporangium juniperi-virginianae*), the effects of the disease on both cedar and apple hosts, the importance of another thoroughgoing eradication campaign, and an account of quince rust (*G. germinale*), which is reported as comparatively new on apples in the section involved.

The development of apple scab, J. M. HAMILTON (*N. Y. State Hort. Soc. Proc., 80 (1935), pp. 160–164*).—This paper from the New York State Experiment Station gives a semipopular discussion of the development and control of apple scab.

Weather conditions and apple scab prevalence during 1933, J. F. ADAMS (*Peninsula Hort. Soc. [Del.] Trans., 47 (1933), pp. 67, 68, fig. 1*).—This is a contribution from the Delaware Experiment Station.

Cherry leaf spot control, G. W. KEITT (*Canner, 82 (1936), No. 11, II, p. 47*).—The results of this study by the Wisconsin Experiment Station indicate that the fungus of leaf spot of cultivated cherries is not harbored to any extent on other species in Wisconsin, though it can infect mahaleb cherry and pin cherry (*Prunus pennsylvanica*). It is overwintered in dead leaves on the ground, and plowing these under before blooming greatly reduced leaf spot development.

Among the sprays tested, bordeaux mixture gave the best control, and a 3–4–50 formula, using a high calcium hydrated lime, is recommended. The first treatment is made when about three-fourths of the petals have fallen, the second about 2 weeks later, and the third just after harvest. When lime-sulfur is used an additional application 2 weeks after the second is needed. Any disadvantage incident to the dwarfing effects of bordeaux mixture on the fruit was much more than offset by the better disease control and the superior fruitfulness.

Control of fungous disease of the peach, R. H. HURT (*Va. Fruit, 24 (1936), No. 1, pp. 123–127*).—This note is a contribution from the Virginia Experiment Station.

Peach canker investigations.—II, Infection studies, R. S. WILLISON (*Canad. Jour. Res., 14 (1936), No. 1, Sect. C, pp. 27–44, pls. 3, figs. 3*).—Continuing these studies (E. S. R., 71, p. 59), "two species of *Valsa* have been isolated more or less consistently from cankers of various ages and from 'die-back' twigs on the peach. In culture, one species, identified as *V. leucostoma* (Pers.) Fr., is hair brown and has small, dark pycnidia exuding cirri when mature. On the host its stroma is compact in texture, contains no host cells, and is delimited beneath by a black zone of carbonized fungal and host cells. Ascospores of *V. leucostoma* measure 10μ–17μ by 2μ–4.5μ.

The other species, which has been assigned to *V. cincta* Fr., is whitish to olive buff in culture and has large light-colored pycnidia containing, though rarely exuding, spores. On the host, the stroma of *V. cincta* is comparatively loose in texture, contains host cells, and is deliminted from the cortex of the host by a thin, black zone, sometimes only marginal. Ascospores of *V. cincta*

measure 14μ–28μ by 4μ–7μ. In both species the pycnospores range from 5μ to 10μ in length and from 1μ to 2μ in width.

These organisms, along with *Sclerotinia fructicola* (Wint.) Rehm., were used in series of infection experiments at frequent intervals over a period of 2 yr. Similar series of checks were also provided. Periodical observations and measurements furnished detailed case histories of all wounds concerned. *V. cincta* was found to be a virulent wound parasite, able not only to infect freshly made wounds during the late autumn, winter, and spring, but also to give rise to perennial cankers. Infection with this organism rarely occurred during June, July, and August. *V. leucostoma* proved in these experiments to be almost, if not quite, incapable of initiating cankers on the peach. *S. fructicola* parasitized the tissues of branches and produced considerable necrosis during the first 3 weeks after inoculation during the growing season. Subsequently the lesions proceeded to heal. The degree of infection and the amount of resultant necrosis in wounds inoculated with *S. fructicola* during the dormant season were dependent upon the conditions of temperature and humidity then prevailing. *S. fructicola*, while capable of inducing lesions on the stem, cannot be regarded as the cause of typical peach canker. Some of the factors influencing infection by the three organisms mentioned above are briefly discussed."

Our present knowledge on the dissemination of yellows and little peach, T. F. MANNS (*Peninsula Hort. Soc. [Del.] Trans., 47 (1933), pp. 17–19*).—This is a contribution from the Delaware Experiment Station.

Studies in cellular pathology.—I, Effects of cane gall bacteria upon gall tissue cells of the black raspberry, W. M. BANFIELD (*Bot. Gaz., 97 (1935), No. 2, pp. 193–239, pl. 1, fig. 1*).—The bacteria inciting cane gall on fruiting canes of black raspberry occurred primarily between the cells of infected tissues and ramified throughout the gall tissue in the form of zoogleal strands which dissolve the middle lamellae of the cell walls. Numerous degenerating or necrotic protoplasts may be filled with bacterial thalli in certain areas of the gall, and frequently the lumens of such cells become completely filled by bacteria. The bacteria may also occupy pockets resulting from the lysis of masses of protoplasts and their cell walls, and they may be discharged from the intercellular spaces or cavities prior to the disintegration of the gall.

Affected cells undergo cytolysis. In the early stages of gall formation the cells at a distance from the bacteria may divide repeatedly. Later, intercellular penetration may occur, and in turn the cells at a distance may be incited to extensive division. Eventually, division ceases, the intercellular penetration continues, and the gall degenerates both by cytolysis and by autolysis. The details of these degenerative processes are given.

The visible structure of the cytoplasm of the healthy cells or of those in which a diseased state has been induced by the cane gall bacterium is the structure imparted to it by the various states and arrangements of its contained bodies (mitochondria, plastids, and fat). In diseased cells this structure may be granular, alveolar, and reticular, or it may appear as various three-dimensional, open-network patterns. In healthy cells the structure is that of a polyphasic complex composed of a clear ground substance, without visible structure, in which various spherical, rodlike, or threadlike mitochondria and spherical fat globules are dispersed, and in which the larger, starch-bearing plastids may be also dispersed or aggregated into various group patterns.

On the basis of these studies it is concluded that the bacteriumlike bodies observed by various investigators within the still living tissue cells of crown galls were normal elements of the chondriome of the cells rather than bacteria.

The bacteria in gall tissues of black raspberry are frequently decidedly limited in number. It has been assumed by many that this disease is induced by *Phytomonas tumefaciens* (*Bacterium tumefaciens*), but the author believes that conclusive proof of the identity of the cane gall and crown gall diseases of bramble fruits is lacking.

Sources of raspberry mosaic infection and how to get rid of them, L. M. COOLEY (*N. Y. State Hort. Soc. Proc., 80 (1935), pp. 273–277*).—This contribution from the New York State Experiment Station gives a semipopular discussion of the results of experiments in western New York as showing that, given proper conditions of isolation from natural sources of infection, raspberry mosaics can be kept under control and that plantings of relatively virus-free black raspberries can be maintained. Wild red raspberries are a source of infection, and chemical means for their eradication have proved efficient.

Cause and control of important avocado diseases, W. T. HORNE (*Calif. Avocado Assoc. Yearbook, 1935, pp. 141–143*).—This is a contribution from the California Citrus Experiment Station.

Accumulations of salts in the tips of avocado leaves in relation to tipburn, A. R. C. HAAS (*Calif. Avocado Assoc. Yearbook, 1935, p. 105*).—In this note from the California Citrus Experiment Station, it is concluded that analyses confirm the relation between salt accumulation and tipburn of the leaves.

Effects of sun-blotch on the anatomy of the avocado stem, C. A. SCHROEDER (*Calif. Avocado Assoc. Yearbook, 1935, pp. 125–129, figs. 6*).—From the preliminary studies of the stem conditions reported, it appears that the virus of the disease is intermittent in its effect on the differentiation of the cells as they are being cut off from the cambium. It is also concluded that the virus is closely associated with the cambial activity of the stem and that it induces the abnormal production and differentiation of vascular tissue.

The importance of some citrus forms with acid fruits, as occurring in India, in relation to the search for strains resistant to "mal secco" [trans. title], A. BIRAGHI (*Bol. R. Staz. Patol. Veg. [Roma], n. ser., 15 (1935), No. 3, pp. 424–441; Eng. abs., pp. 439, 440*).—This is a report of a survey carried out in the northern and western parts of British India for the purpose of collecting indigenous forms of lemons to be tested for resistance to the disease due to *Deuterophoma tracheiphila*. Lemons (*Citrus limonum* [*C. limonia*]) are limited to experimental plantings, the widely distributed limes (*C. aurantifolia*), often found growing wild, taking their place in common use. Many indigenous forms of citron (*C. medica*) were found, but the majority of *Citrus* forms bearing fruits with yellow rinds and acid juice were morphologically intermediate between limes and lemons and apparently must be grouped separately. The essential oil of all these forms also differed from that of limes and lemons.

A Sphaceloma on fruit of Hesperethusa crenulata, a remote citrus relative from India, A. E. JENKINS (*Phytopathology, 26 (1936), No. 1, pp. 71–73, fig. 1*).—Citrus scab (*S. fawcettii*) on the remote citrus relative *Clausena lansium* (tribe Clausineae) has been reported previously. The author here notes the existence of a scab due to *Sphaceloma* sp. on fruits of another remote citrus relative, *H. crenulata* (tribe Triphasinae).

The influence of potash fertilization on the healing of wounds in lemon fruits [trans. title], A. SINDONI (*Bol. R. Staz. Patol. Veg. [Roma], n. ser., 15 (1935), No. 3, pp. 490–495, figs. 2*).—In lemon fruits from trees fertilized with sulfate of potash, the phellogen and cork showed a much greater development under superficial wounds than under similar wounds in fruits from trees receiving no potash.

Nitrogen trichloride and other gases as fungicides, L. J. KLOTZ (*Hilgardia [California Sta.], 10 (1936), No. 2, pp. 27–52, figs. 7*).—A mixture of low concentrations of nitrogen trichloride (NCl_3) in air successfully controlled decay due to *Penicillium italicum* and *P. digitatum* in Washington Navel and Valencia oranges, and commercial procedures and apparatus were developed and installed in the plants of 15 packing companies. After from 3 to 4 weeks' storage, losses from decay were reduced by at least 50 to 75 percent with from 3 to 5 3-hr. treatments, using from 5 to 15 mg of NCl_3 per cubic foot of air at from 3- to 4-day intervals, beginning on the date of storage. Preliminary trials indicated that the method may be adaptable to treatment of lemons and grapefruits in storage, using lower gas concentrations over long periods.

Concentrations as low as from 4 to 6 mg of NCl_3 per cubic foot of air for 30 min. proved lethal to conidia of *P. italicum*, *P. digitatum*, *Oospora citri-aurantii*, *Colletotrichum gloeosporioides*, *Alternaria citri*, and *Botryosphaeria ribis*, and to *Phytophthora citrophthora* mycelium. The protoplasts of the treated spores, germ tubes, and hyphae were shrunken away from the cell walls, and in some cases there were marked granular and coagulation effects.

Chlorine at the same concentrations as NCl_3 injured the fruit and was much less effective against decay, but, since it proved more toxic to the fungi in cultures, it may be used for general disinfection of packing houses and equipment. Ozone had very slight toxicity (or none) for the decay organisms and gave no protection to the fruit. Preliminary tests indicated that the more costly monomethychloramine may be substituted for NCl_3. Sulfur dioxide was effective for sterilization of boxes and for general disinfection.

An annotated list of noteworthy plant organisms on the genus Coffea, supplemented by the diseases of physiological or unknown origin [trans. title], F. L. HENDRICKX (*Ann. Gembloux, 42 (1936), No. 1, pp. 20–25*).—This is an annotated bibliography.

Diseases of the tea bush.—I, Diseases in general and fungi in particular, C. H. GADD (*Tea Quart. [Tea Res. Inst. Ceylon], 8 (1935), No. 3, pp. 132–139*).—This is an address delivered before the British Association.

The moisture relations of pecan leaves, A. H. FINCH and C. W. VAN HORN (*Science, 83 (1936), No. 2150, p. 260*).—This is a note from the University of Arizona on the nonwilting of pecan leaves under water deficiency, followed after the critical point by "drought necrosis" and frequently ending in abscission. Experiments indicated that in necrotic leaves transpiration was very slow, whereas in normal leaves it occurred freely under wide extremes of soil moisture. A greater amount of starch and hemicellulose cell wall thickenings, but a lower nitrogen content, occurred in shoots from dry than from wet plats. Thus conditions favoring carbohydrate storage obtain in a moderately dry soil, and it is suggested that in soil moisture control may lie an important means for regulating the formation and utilization of carbohydrate reserves in the tree.

Walnut infection by fungi [trans. title], D. PRUTENSKII (*Sovet. Subtrop. (Soviet Subtrop.), No. 5 (1935), p. 112*).—This note refers to *Fomes fomentarius*, *Polyporus hispidus*, *Marsonia juglandis*, and *Cylindrium* sp.

An account of sclerote-forming fungi causing diseases in Matthiola, Primula, and Delphinium in Victoria, I. G. BALFE (*Roy. Soc. Victoria, Proc., n. ser., 47 (1935), No. 2, pp. 369–386, figs. 9*).—Previous records of *Rhizoctonia solani* in Victoria are restricted to potato and turnip. It is here reported as causing damping-off of stock (*M. incana*) seedlings and is compared with three other strains.

Sclerotinia minor is reported as causing a collar rot of *P. malacoides*. Its cultural characters, including saltation, are discussed.

Corticium centrifugum is recorded as causing a root and collar rot of delphiniums. Its cultural characters are given and comparisons are made with another strain and with *Sclerotium delphinii*.

A pyrethrum preparation for the control of eelworms [trans. title], H. RIECHERS (*Blumen u. Pflanzenbau ver. Gartenwelt, 39 (1935), No. 49, p. 596*).—The author reports good results in the control of nematodes on begonias by the use of the pyrethrum preparation Hydra-Tox-Ultra.

Wilt, stem rot, and dieback of the perpetual flowering carnation, G. M. WICKENS (*Ann. Appl. Biol., 22 (1935), No. 4, pp. 630–683, pls. 2, figs. 6*).—A historical and general survey of the problem is first given.

From the collars of diseased plants, *Verticillium cinerescens, Fusarium culmorum, F. herbarum*, and a fungus provisionally identified as *F. dianthi* were isolated. When made from the xylem and pith only, isolations of *F. culmorum* and *F. herbarum* were greatly reduced in frequency.

From the results of inoculation tests, it is concluded that stem rot is a complex of three symptomatically and etiologically distinct diseases: *Verticillium* wilt due to *V. cinerescens*, *Fusarium* wilt due to *F. dianthi* (provisionally identified), and stem rot due to *F. culmorum, F. herbarum*, and possibly other *Fusarium* spp. A key to these diseases is given.

Die-back, the symptoms of which are described, appears to be due mainly to *F. culmorum*.

The relative economic importance of all these diseases, the morphological and cultural features of the fungi concerned, including data on the influence of temperature on growth, and the influence of soil temperature and moisture on the incidence of *Verticillium* wilt are all discussed.

Since *V. cinerescens* has been isolated from parts of shoots well beyond the limits of any macroscopically visible internal or external symptoms, infection of a fresh crop may come not only from soil contaminated from a preceding crop but also by the introduction into the beds of infected yet apparently healthy plants. Unless the latter source of infection is avoided, control methods based on isolation and sterilization of beds will fail in eradication. A search for resistant seedlings is recommended.

Stripe disease of daffodils, N. K. GOULD (*Jour. Roy. Hort. Soc., 60 (1935), No. 11, pp. 492–500*).—"The results of experiments made at Wisley over a period of 2 yr. may be briefly summarized as follows:

"(1) The stripe disease of daffodils is not transmitted from diseased to healthy bulbs during the hot-water treatment. (2) It has not been found possible to infect healthy plants artificially by means of inoculation or grafting. (3) No recovery from the disease has resulted from treatment of the bulb with hot water, or with certain chemicals in hot and cold solutions. Until some remedial or preventive treatment is found, the only way to keep stocks reasonably clean is by continued roguing."

Further experiments on the Fusarium bulb rot of narcissus, L. E. HAWKER (*Ann. Appl. Biol., 22 (1935), No. 4, pp. 684–708, figs. 2*).—Inoculation of the roots of narcissus with *F. bulbigenum* in the fall indicated that with suitable moisture and rather high temperature it could penetrate and destroy the roots of all varieties tested, and also could penetrate the bulbs of the susceptible varieties via the parasitized roots. However, it is concluded that the temperature conditions in England are seldom favorable to the latter course during the fall. There was also some evidence that penetration of the bulbs might occur from the old roots at the end of the growing season.

The statements by P. H. Gregory[2] (of whose work this is a continuation) that heavy losses from this fungus may follow the fall hot-water treatment against nematodes and that in such cases penetration usually occurs at the base of the bulb were confirmed and amplified. By treatments with hot water bearing spores, carried out at intervals during storage, it was found that the bulbs pass through a phase of minimum susceptibility in late August and early September. The addition of 0.1 percent or more of formalin to the water materially reduced the losses from *Fusarium* infection without harmful effects on the foliage, date of flowering, quality or number of blooms, or the amount of increase in the weight of the bulbs during the growing season. Cold steeps in 0.1 percent mercuric chloride led to a retardation in the date of flowering. However, fungicidal treatments should be made before the normal date for the hot-water treatment, and experiments along this line are in progress..

[Miscellaneous papers on Dutch elm disease] (*Natl. Shade Tree Conf. Proc., 11 (1935), pp. 111–127, 132–145*).—The following papers are included: Status of Dutch Elm Disease Eradication, by L. H. Worthley (pp. 111–121), which summarizes the problem at the time of writing, the organization of eradication forces, and the progress of eradication work; The Dutch Elm Disease From the Research Standpoint, by C. May (pp. 122–127), a general discussion of the subject; Local Situation Relative to Dutch Elm Disease, by E. G. Rex (pp. 132–137), which deals with some of the administrative complications of the work of the preceding year in New Jersey by the U. S. Department of Agriculture and the State Department of Agriculture; Dutch Elm Disease: New York State, by W. H. Rankin (pp. 138–142), a report from the New York State Department of Agriculture and Markets, which summarizes progress made in that State; and Dutch Elm Disease Situation in Connecticut, August 1935, by W. O. Filley (pp. 143–145), a report from the Connecticut [New Haven] Experiment Station.

Report on Dutch elm disease, R. P. WHITE (*Amer. Assoc. Nurserymen Proc., 59 (1934), pp. 103–105*).—This popular note from the New Jersey Experiment Stations reports the status of this disease problem.

Insect vectors of the Dutch elm disease caused by the fungus Ceratostomella ulmi (Schwarz) Buisman, C. W. COLLINS (*Natl. Shade Tree Conf. Proc., 11 (1935), pp. 127–132*).—This report of researches beginning in 1933 includes biological notes on the elm bark beetles, transmission studies with various elm insects, and notes on the field plats and observations. From the studies to date it is concluded that two species of bark beetles, *Scolytus multistriatus* and *Hylurgopinus rufipes*, have acted as carriers of the causal fungus (*C. ulmi*) in the laboratory tests and have been closely linked with it in the field. Three other insects, viz, the red elm bark weevil (*Magdalis armicollis*), the buffalo treehopper (*Ceresa bubalus*), and the elm borer (*Saperda tridentata*), may act as less important vectors, as indicated by laboratory and field tests.

A new disease of the oriental plane-tree (Platanus orientalis L.) prevalent in the Philadelphia area, L. W. R. JACKSON (*Natl. Shade Tree Conf. Proc., 11 (1935), pp. 77–79*).—This is a preliminary report of studies by the U. S. D. A. Bureau of Plant Industry in cooperation with the Allegheny Forest Experiment Station and the University of Pennsylvania of a new disease of *P. orientalis*, the first symptoms of which were longitudinal fissures in the bark all over the trunk. Cross sections of trunks in the regions of these lesions showed that the discolored wood, usually dark brown or black, ex-

[2] Ann. Appl. Biol., 19 (1932), Nov., No. 4, pp. 475–514, pl. 1, figs. 2.

tended inward along the medullary rays. Practically all isolations from the radial discolorations yielded pure cultures of a *Ceratostomella* believed to be closely related to *C. fimbriata*. Inoculations and reisolations of several of these strains implicated this fungus as the cause.

Control of moldy rot [trans. title], A. D'ANGREMOND (*Meded. Alg. Proefsta. Alg. Ver. Rubberplanters Oostkust Sumatra, Rubber Ser., No. 97 (1935), pp. 121–136; Eng. abs., pp. 135, 136*).—Following a brief survey of the literature, the history of moldy rot [*Ceratostomella fimbriata*] on the East Coast of Sumatra is discussed. Several methods of control were tested, among which treating the tapping panels with a carbolineum emulsion every 3 days proved ineffective, and a coal tar-kerosene mixture gave the best results.

Parasitic staining of timber in Italy.—II, An intense staining of pine wood due to Sphaeropsis ellisii cromogena n. v. [trans. title], G. GOIDÀNICH (*Bol. R. Staz. Patol. Veg. [Roma], n. ser., 15 (1935), No. 3, pp. 442–470, pls. 4, figs. 15*).—Continuing the series (E. S. R., 74, p. 509), this paper describes a timber stain in pine shown to be due to *S. ellisii cromogena*. The morphology and cultural characters of the latter and the host-parasite relations are discussed. Most of the mycelium is found in the medullary rays and resiniferous canals, and much less in the tracheids. The fungus fruits with difficulty in culture. Its entry into the host is favored by xylophagous insects. The fungus and the timber injury due to it are illustrated.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Mammals of Indiana, M. W. LYON, JR. (*Amer. Midland Nat., 17 (1936), No. 1, pp. 384, figs. 210*).—The introductory part of this contribution deals with Indiana as the type locality for species of mammals, the physiographic features and ecologic areas, and life zones. The 69 living forms of mammals of the State are then taken up in systematic order. Their range and biology, particularly food, together with references to occurrence in the State based upon cursory observations, a review of the literature, and a 20-page list of references are included.

Experimental Fox Ranch, Summerside, P. E. I.: Progress report of the superintendent, G. E. SMITH (*Canada Expt. Farms, Expt. Fox Ranch, Summerside (P. E. I.), Rpt. Supt., 1931–34, pp. 57, fig. 1*).—This report of the experimental work conducted (E. S. R., 67, p. 419) includes the maintenance ration, vitamin requirements, and seasonal nutritional requirements of silver foxes in captivity; influence of sunlight; factors influencing the production of a clear black color of the fur of silver foxes, the growth and texture of the guard hairs, the development of the silver hairs, the growth and texture of the underfur of silver foxes, and the shedding of the guard hairs and underfur during the summer months; influence of shade on the development of foxes in captivity; determination of the normal cycle of breeding foxes during the entire year and the food requirements necessary for the changes during the different seasons; normal growth of fox pups in respect to weight and length; actual amount of food in terms of caloric value to produce a given gain in weight in a normally growing fox pup during different stages of growth; food requirements for the normal growth and development of fox pups; inheritance of the inherent characteristics of the fur of silver foxes; influence of inbreeding and outcrossing on the fur of silver foxes; effect of intense inbreeding on the vitality and fertility of silver foxes in captivity; breeding experiments with red, cross red, and patch foxes; and control of internal and external parasitic infestation.

Contribution to the biology, particularly reproduction, of the hamster Cricetus cricetus L. [trans. title], H. PETZSCH (*Kleintier u. Pelztier, 12 (1936), No. 1, pp. 1–83, figs. 8*).—A study of the biology of the German marmot is reported, accompanied by a list of 73 references to the literature.

Susceptibility of the opossum (Didelphis virginiana) to the virus of endemic typhus fever, G. D. BRIGHAM (*Pub. Health Rpts. [U. S.], 51 (1936), No. 13, pp. 333–337, figs. 4*).—The studies here reported indicate that the opossum is susceptible to the virus of endemic typhus fever.

The birds of Saint Lucia, S. T. DANFORTH (*Puerto Rico Univ. Monog., Phys. and Biol. Sci., Ser. B, No. 3 (1935), pp. 129, pl. 1*).—This contribution brings together information on the avifauna of St. Lucia, as based upon a visit to the island in 1931 and a review of the literature, a seven-page list of which is included.

Life history of the Gambel quail in Arizona, D. M. GORSUCH (*Ariz. Univ. Bul., 5 (1934), No. 4, pp. 89, figs. 9*).—An account of the biology of *Lophortyx gambeli gambeli* Gambel, also known as the desert quail, Gambel partridge, and Arizona quail, including its parasites, diseases and injury, nesting losses, natural enemies, and other factors affecting its numbers, is given, and 18 references to the literature are cited.

This quail is said to be equal in importance to any game species occurring in Arizona.

The winter of 1934–35 and Iowa bob-whites, P. L. ERRINGTON (*Amer. Midland Nat., 17 (1936), No. 2, pp. 554–568*).—This is a report, contributed from the Iowa Experiment Station, of the sixth of a series of seasons in which field studies have been made of the wintering of bobwhite quail under Wisconsin and Iowa conditions (E. S. R., 74, p. 63).

Michigan waterfowl management, M. D. PIENIE (*Lansing: Dept. Conserv., 1935, pp. XXI+328, pls. 2, figs. 212*).—Part 1 of this work consists of an introduction to the Michigan waterfowl problems, including accounts of the Michigan waterfowl, the status of waterfowl, their natural enemies, and waterfowl hunting (pp. 1–92); part 2 (pp. 92–314) deals with wildlife management and the waterfowl program, including the management idea, laws and regulations, refuges and sanctuaries, the duck food problem, planting programs, propagation and restocking, predator control, waterfowl activities and a management calendar, restoration, a key to 50 common aquatic plants of Michigan, and sample meals of ducks taken in Michigan. A 7-page list of references to the literature, an index, and an infolded map are included.

Some recent developments in the study of parasitic worms, G. THEILER (*So. African Jour. Sci., 32 (1935), pp. 49–71*).—This contribution is presented with a list of 33 references to the literature.

[Contributions on economic insects] (*Assoc. South. Agr. Workers Proc., 35 (1934), pp. 332, 333, 344, 345*).—Contributions relating to economic insects and their control, presented at the annual convention of the Association of Southern Agricultural Workers held at Memphis, Tenn., in January and February 1934, include the following: A Report on the Use of Creosote Oil to Control San Jose Scale and Peach Leaf Curl, by W. W. Stanley, S. Marcovitch, and J. O. Andes (pp. 332, 333); and Insects as Possible Distributing Agents of Cotton Root Rot Caused by *Phymatotrichum omnivorum* (p. 344) and Insects as Possible Distributing Agents of Cotton Wilt Caused by *Fusarium vasinfectum* (pp. 344, 345), both by J. J. Taubenhaus and L. D. Christenson, contributed from the Texas Experiment Station.

[Work in entomology by the New Haven Station] (*Connecticut [New Haven] Sta. Bul. 381 (1936), pp. 179–185*).—The work of the year briefly referred

to includes spray tests for foliage burn by lead arsenate, control of the oriental fruit moth, substitutes for lead arsenate, removal of spray residue from fruit, experiments with oil sprays, European pine shoot moth and potato flea beetle control, attack on soiled spots in cloth by clothes moths, spruce gall aphid, Asiatic beetle and Japanese beetle control, date of planting and European corn borer infestation, the corn earworm, mosquito control, and the occurrence of two new insects in the State (the European spruce sawfly (*Diprion polytomum* Hartig) and a scale (*Matsucoccus matsumurae* Kuw.) on pitch pine).

[Contributions on economic insects] (*Conn. Veg. Growers' Assoc. Rpt., 1933, pp. 41–44, 72–78*).—Contributions presented in January 1934 are as follows: Experimental Work on Vegetable Insects in 1933 (pp. 41, 42), Report on Vegetable Insects in 1933 (pp. 42–44), and The Corn Ear Worm and the European Corn Borer and Their Control (pp. 72–78), all by W. E. Britton.

[Report of work in economic entomology by the Maine Station] (*Maine Sta. Bul. 380 (1935), pp. 168, 208–212, 219, 220, 230, 231, 253, 254*).—Reporting upon the work of the year reference is made to control of flea beetles on potatoes, by G. W. Simpson; apple fruitfly, electric light traps for combating apple insects, and dusting for blueberry fruitfly, all by F. H. Lathrop and C. O. Dirks; the Mexican bean beetle, by J. H. Hawkins; arsenical substitutes for the control of cabbageworms on cole crops in Aroostook County, by Simpson; and larval production and adult emergence of the apple fruitfly in relation to apple varieties, by Dirks (E. S. R., 73, p. 79).

[Report of work in economic entomology by the Ohio Station] (*Ohio Sta. Bul. 561 (1936), pp. 43–51, fig. 1*).—The work of the year briefly referred to includes the influence of variety on potato leafhopper population, onion thrips, and ovicidal tests on onion maggot eggs, all by J. P. Sleesman; mortality of first instar larvae of the European corn borer, wheat yield and chinch bug abundance, and southern corn rootworm contribution to lodging in corn, all by L. L. Huber; black wheat-stem sawfly (*Trachelus tabidus* Fab.), by J. S. Houser; apple flea weevil, by Houser and R. B. Neiswander; oriental fruit moth and lesser peach borer, both by R. B. Neiswander; white grub (*Phyllophaga hirticula* Knoch.) control in lawns and ornamental plant insects (red spider and onion and gladiolus thrips), both by C. R. Neiswander; cabbageworms and cutworm control by sprays and dusts, both by H. L. Gui; control of codling moth and apple aphids, both by C. R. Cutright; and American foulbrood, by W. E. Dunham.

[Report of the Entomological Branch] (*Canada Min. Agr. Rpt., 1934–35, pp. 58–72*).—The occurrence of and progress of control work with economic insects in Canada are reported under the headings of the crops or products affected.

[Contributions on economic insects] (*Rev. Path. Vég. et Ent. Agr. France, 22 (1935), No. 2, pp. 99–179, figs. 16*).—The contributions here presented are as follows: Preliminary Note on the Beetles of the Genus *Cassida* Injurious to Sugar Beet [trans. title], by L. Mesnil (pp. 99–104); The Important Injuries Caused in the Mountain Orchards of French Switzerland in 1933 by the Apple Fruit Moth (*Argyresthia conjugella* Zell.) [trans. title], by P. Bovey (pp. 105–114); Injuries Caused by *Cnephasia virgaureana* Treits. to Strawberry Culture in Eastern France [trans. title], by [G.] Viennot-Bourgin (pp. 115–122); Note on the Cabbage Webworm (*Hellula undalis* Fab.), a Pyralid Injurious to Crucifers in Western Morocco [trans. title], by R. Bouhelier and Hudault (pp. 123–130); Observations on the Biology of the Macrolepidoptera of Morocco [trans. title], by M. L. Jourdan (pp. 131–167); and Notes on Moroccan Lepidopterology [trans. title], by C. Rungs (pp. 168–179).

Report of the chief entomologist, R. VEITCH (*Queensland Dept. Agr. and Stock, Ann. Rpt., 1934–35, pp. 68–72*).—A brief report is given of work with economic insects and their control for the year ended June 30, 1935.

[Work in economic zoology and entomology in the Philippine Islands] (*Natl. Res. Council Philippine Isl. Rpt., 1 (1935), pp. 437–456, 472–480*).—Contributions relating to the history of economic zoology and entomology in the Philippines are as follows: Problems in Philippine Fisheries, Including Ichthyology and Herpetology, by D. V. Villadolid (pp. 437–446); The Development of Mammalogy in the Philippines (pp. 447–450) and Ornithology in the Philippines (pp. 451–456), both by C. G. Manuel; and A Historical Résumé of Philippine Entomology, by L. B. Uichanco (pp. 472–480).

[Contributions on fruit insects and their control] (N. Y. *State Hort. Soc. Proc., 79 (1934), pp. 15–24, 27–32, 33–46, 48–54, 201–206*).—Contributions presented at the annual meeting of the society held at Rochester and Kingston in January 1934 (E. S. R., 73, p. 646), include the following: Tar Distillate Emulsions for Rosy [Apple] Aphid Control, by F. Z. Hartzell (pp. 15–24), and Spray Recommendations for Codling Moth Control in Western New York, by S. W. Harman (pp. 27–32), both contributed from the New York State Experiment Station; The Status of Codling Moth Control With Insecticides, by R. L. Webster (pp. 33–46), contributed from the Washington Experiment Station; Methods of Spray Residue Removal, by W. T. Pentzer (pp. 48–54); and New Developments in Apple Pest Control in the Hudson Valley, by P. J. Chapman (pp. 201–206).

[Fruit insect control in Washington State] (*Better Fruit, 30 (1936), Nos. 9, pp. 3–5, 12, 13; 10, pp. 6, 22*).—Recommendations for Codling Moth and Mite Control in Washington for 1936, by the staff of the Washington Experiment Station (pp. 3–5), and The Present Status of Calcium Arsenate in Codling Moth Control, by J. Marshall and K. Groves, also of that station (pp. 12, 13; 6, 22), are presented.

Further studies on the control of leafhoppers and tip-borers on mango inflorescence, M. A. PALO and C. E. GARCIA (*Philippine Jour. Agr., 6 (1935), No. 4, pp. 425–464, pls. 7*).—Work with the leafhoppers *Idiocerus niveosparsus* Leth. and *I. clypealis* Leth. and the tip borer *Chlumetia transversa* Wlk., the combined attack of which on mango inflorescence in the Philippines has caused enormous losses in crops during 5 or 6 yr., is reported, in continuance of earlier studies (E. S. R., 69, p. 387).

The study of the tip borer has shown that an average of 26.5 days is required for the completion of its life cycle. The application of 0.5 percent lead arsenate at intervals of 3 or 4 days beginning when the panicles are about 2 to 6 cm long was found to aid greatly in reducing the ravages of the tip borer pest. This control was, however, found useless in increasing the crop unless the leafhoppers which are always found associated with the tip borer pest are also satisfactorily controlled. The results of seven series of spraying experiments to control the leafhoppers with soap solution of 0.5- and 0.4-percent concentrations are discussed. While laundry soaps are effective in killing the leafhopper nymphs, not all solutions of soaps from different factories are safe to apply to the mango flowers owing to their variability in composition.

It is pointed out that spraying on mango inflorescence with soap solution should be undertaken with great caution. It is said that the use of the Dietz lantern or Coleman lamp will aid greatly to minimize the infestation by leafhoppers, tip borers, and other mango insects if set during the flowering period.

A list is given of 28 references to the literature cited.

Insects of the coconut palm in the British Solomon Islands, R. J. A. W. LEVER (*Agr. Gaz. [Brit. Solomon Isl.], 1 (1933), No. 4, pp. 15, 16; 2 (1934), No. 3, pp. 7, 8; 3 (1935), No. 4, pp. 6, 7*).—An annotated list of 95 insect enemies of the coconut palm in the British Solomon Islands.

Insect damage in newly gathered and in stored illipe nuts (Shorea and Isoptera spp., fam. Dipterocarpaceae), L. G. E. KALSHOVEN (*Landbouw [Buitenzorg], 11 (1935), No. 4, pp. 146–154; Eng. abs., p. 154*).—A report is given of a preliminary investigation of insect damage to fruits of tengkawang species (illipe nuts) which are exported to Europe from West Borneo.

Insect and mite enemies of amaryllis and their control, F. F. SMITH (*Amer. Amaryllis Soc. Yearbook, 1 (1934), pp. 94–96*).—A practical account is given of the insect pests of amaryllis so far as known, grouped according to the type of injury or part of plant fed upon.

Insects injurious to forest and shade trees, F. G. C. TOOKE (*Union So. Africa Dept. Agr. and Forestry Bul. 142 (1935), pp. 52, figs. 25*).—A practical account of injurious forest and shade tree insects met with in the Union of South Africa, their natural enemies and control measures.

Insect enemies of Abies numidica [trans. title], A. BARBEY (In *Une relique de la sapinière méditerranéenne, le Mont Babor. Gembloux: Jules Deculot, 1934, pp. 47–69, pls. 10*).—This account of insects attacking *A. numidica* includes photographic illustrations of many forms.

Notes on the relation of insects to disease, W. A. RILEY (*Mil. Surg., 77 (1935), No. 5, pp. 256–267*).—A practical account dealing with the poisonous arthropods, parasitic arthropods, and arthropods as transmitters and disseminators of disease.

Non-poisonous substitutes for arsenicals, C. C. HAMILTON (*Natl. Shade Tree Conf. Proc., 11 (1935), pp. 83–89*).—A practical contribution from the New Jersey Experiment Stations, with particular reference to nicotine, pyrethrum, and derris.

Bait pails, M. L. BOBB (*Va. Fruit, 24 (1936), No. 3, pp. 20–22*).—The results of tests made during the season of 1935 at the Virginia Experiment Station of a number of attrahents in combination with several different bait solutions, the details of which are tabulated, are reported to have shown Goulac to be an ideal solution to use in bait pails. Commercial experiments in the Crozet section are said to have proved the efficiency of bait pails as an aid in controlling the oriental fruit and codling moths in heavily infested orchards.

Results with beta naphthol bands in 1935, A. M. WOODSIDE (*Va. Fruit, 24 (1936), No. 3, pp. 18–20*).—A brief account is given of the results obtained in tests of β-naphthol bands at the Virginia Experiment Station in 1935 for control of the codling moth. The three types of home-made, cold-dipped bands and six brands of commercial bands are said to have given satisfactory results in the orchard tests, although analyses showed that some of them had a lighter coating than is considered advisable.

Termite control in buildings in Connecticut, N. TURNER and J. F. TOWNSEND (*Connecticut [New Haven] Sta. Bul. 382 (1936), pp. 205–242, figs. 15*).—In this discussion of the eastern subterranean termite (*Reticulitermes flavipes* Kollar), the authors report upon various methods of termite control and prevention applicable in Connecticut. The details of termite-resistant construction and alteration of buildings are given in an appendix. A list of 31 references to the literature is included.

The factors that control grasshopper outbreaks, E. D. BALL (*Bul. Ecol. Soc. Amer., 16 (1935), No. 4, pp. 35, 36*).—The author is led to conclude that rodents are a very minor factor in grasshopper control.

The life history of the red locust Nomadacris septemfasciata (Serville), J. C. FAURE (*Union So. Africa Dept. Agr. and Forestry Bul. 144 (1935), pp. 32, pls. 6*).—This is an extended report of studies of the biology of this grasshopper, presented with a list of 14 references to the literature. Colored illustrations of the several stages of the swarming and solitary phases of this species and of the brown locust *Locustana pardalina* (Walk.), the tropical migratory locust *Locusta migratoria migratorioides* (Rch. & Fre), and the desert locust *Schistocerca gregaria* (Forsk) are given on plates.

[Contributions on African grasshoppers] (*Bul. Ent. Res., 27 (1936), No. 1, pp. 1–190, pls. 7, figs. 39*).—Contributions relating to migratory grasshoppers and their control include the following: The Growth-Changes and Structure of the Egg of the African Migratory Locust (*Locusta migratoria migratorioides* R. & F. (Orthoptera, Acrididae)), by M. L. Roonwal (pp. 1–14); Notes on the Red Locust (*Nomadacris septemfasciata* Serv) in Nyasaland, 1933–34, by C. Smee (pp. 15–35); The Outbreak Centres of *Schistocerca gregaria* Forsk. on the Red Sea Coast of the Sudan (pp. 37–66) and A Short Reconnaissance of Northern Darfur (Anglo-Egyptian Sudan) With Regard to *Schistocerca gregaria* Forsk. (pp. 71–76), both by R. C. Maxwell-Darling; Observations on Rate of Growth, Coloration, and the Abnormal Six-Instar Life-Cycle in *Locusta migratoria migratorioides* R. & F., by K. H. L. Key (pp. 77–85); Phase Variation and Rate of Development in the Algerian Race of the Migratory Locust (*Locusta migratoria* L.), by B. P. Uvarov and A. G. Hamilton (pp. 87–90); The Oriental Migratory Locust (*Locusta migratoria manilensis* Meyen 1835), by B. P. Uvarov (pp. 91–104); and *Locusta migratoria migratorioides* R. & F.: An Ecological Reconnaissance of the Suspected Middle Niger Outbreak Area, by O. B. Lean (pp. 105–184).

The distribution of the migratory locust and ecological study of its breeding ground in China, T. L. TSOU (*Agr. Sinica, 1 (1935), No. 8, pp. 239–272, figs. 17; Eng. abs., pp. 265–267*).—This is a preliminary report of a study made of the permanent breeding grounds and the migratory areas of *Locusta migratoria* L. in China.

Observations on the onion thrips (Thrips tabaci Lind.), H. M. HARRIS, C. J. DRAKE, and H. D. TATE (*Iowa State Col. Jour. Sci., 10 (1936), No. 2, pp. 155–171, pls 3, figs. 4*).—This contribution from the Iowa Experiment Station deals largely with experiments with onion thrips carried on in conjunction with a survey of the insect pests of the onion. It includes a report on the results of population counts, injury caused by feeding, sex ratio and parthenogenesis, longevity of the female, life stages, and duration of developmental stages. A four-page list of references to the literature is included.

A list of the Thysanoptera of California, S. F. BAILEY (*Pan-Pacific Ent., 11 (1935), No. 4, pp. 163–169*).—A list is given on 107 species of thrips known to occur in California.

A new thrips on cotton, D. MOULTON (*Philippine Jour. Agr., 6 (1935), No. 4, pp. 475–477*).—Under the name *Bussothrips claratibia* n. sp., the author describes a new form that is a pest on cotton and other plants in the vicinity of Manila.

Thrips investigation.—VIII, The influence of temperature on the rate of development of the immature stages of Thrips imaginis Bagnall and Haplothrips victoriensis Bagnall, H. V. ANDREWARTHA (*Jour. Council Sci. and Indus. Res. [Austral.], 9 (1936), No. 1, pp. 57–64, figs. 3*).—In continuation of this study (E. S. R., 74, p. 819), a report is made on the relationship of temperature and speed of development in immature stages of *T. imaginis* and *H. victoriensis*, the former taken from a laboratory colony and the latter collected in the field. Temperatures were kept constant to within ±1° C., while

the humidity was kept uniform at a saturation deficiency of 5 mm of mercury except for the incubation period of *T. imaginis* where the atmosphere was saturated. The relationship between the temperature and rate of development is expressed as a straight line for both the incubation and the postembryonic development in the two species. The zero of the velocity curve and thermal constant were determined in each case.

The apple thrips (Thrips imaginis Bagnall) in South Australia, J. DAVIDSON (*Jour. Dept. Agr. So. Australia, 39 (1936), No. 7, pp. 930–939, figs. 4*).—Following a brief introduction, a description is given of *T. imaginis*, its life history, food plants and habits, fluctuations in numbers throughout the year, and control measures. It occurred throughout the southern States of Australia during the spring of 1931, infesting apple blossoms in large numbers during October. Its attack resulted in a poor setting of fruit in the midsummer and late varieties of apples. Bush and berry fruits, and garden flowers also, suffered considerable damage.

Coffee thrips: A contribution to our knowledge of the cause of outbreaks, F. B. NOTLEY (*East African Agr. Jour., 1 (1936), No. 4, pp. 283–292, figs. 7*).—Examinations of climatic conditions recorded and the incidence of the coffee thrips *Diarthrothrips coffeae* Williams during the years 1932–35 have shown a close correlation between average mean monthly temperatures and thrips outbreaks.

Effect of different varieties of sorghum on biology of the chinch bug, R. G. DAHMS, R. O. SNELLING, and F. A. FENTON (*Jour. Amer. Soc. Agron., 28 (1936), No. 2, pp. 160, 161*).—A brief report is made of studies of the effect of chinch bug feeding on different sorghum and corn varieties conducted over a period of several years by the U. S. D. A. Bureau of Plant Industry field station at Lawton, Okla., and the Kansas Experiment Station cooperatively. The work has shown the milos to be very susceptible to chinch bug injury, that the feteritas are somewhat less susceptible, and that the kafirs and sorgos in general are rather resistant.

In 1935 the effect of representative varieties of sorghum on the biology of the chinch bug was studied in cooperation with the Oklahoma Experiment Station, including the highly susceptible Dwarf Yellow milo; common feterita, which is slightly less susceptible than Dwarf Yellow milo under field conditions; Blackhull kafir; and Atlas sorgo, a highly resistant variety.

Seedling plants of Atlas sorgo and Dwarf Yellow milo were used in studies to determine the effect of the host plant on the oviposition of overwintered females and also on the rate of development of first-generation nymphs. Overwintered adults were collected from a field of barley and placed in cages with these varieties for food. Individual oviposition records were kept for all females. These females had probably laid some eggs in the field, but during the remainder of their life period 12 females feeding exclusively on Atlas sorgo laid a total of 51 eggs and 14 females on Dwarf Yellow milo deposited 1,027 eggs. The longevity of the respective females was 8.5 days on Atlas and 23 days on Dwarf Yellow milo plants.

Complete records kept of eggs laid by 10 adult first-generation females showed for the 10 Dwarf Yellow milo 1,179 eggs and an average length of life of 40 days. Eight females of the 10 feeding on Blackhull kafir deposited 219 eggs, and their average longevity was 29 days. Of the 10 females feeding on Atlas sorgo, only 4 laid eggs, a total of 9 being deposited, and 15 days was the average longevity. "No eggs were laid by the 10 females feeding on feterita, which indicated unsuitability for oviposition in the seedling stage, although it is a susceptible variety under field conditions. Results are avail-

able which show that this variety develops considerable susceptibility as the plants become older.

"Data have also been obtained which prove that chinch bugs reared on a susceptible variety can pass through their immature stages in much less time than those which are fed on a resistant variety. The average duration of the immature stages was 35.3 days when fed on Dwarf Yellow milo and 45 days when fed on Atlas sorgo. The mortality of nymphs, after the first instar, when reared on Dwarf Yellow milo was 8 percent as compared with 84 percent when Atlas sorgo was the food plant. The average body length of adults reared on Dwarf Yellow milo was nearly 0.5 ml greater than that of those reared on Atlas sorgo.

"Other experiments indicate that chinch bugs have the ability to select plants of a susceptible variety for feeding in preference to those of a resistant variety when the plants of both varieties are placed adjacent to one another. Data have likewise been obtained in the laboratory which show that chinch bugs will kill plants of a susceptible variety in much less time than those of a resistant variety. The same number of bugs were confined on the different varieties tested under identical conditions in regard to age of plant, time of exposure, and, so far as known, all other conditions."

The green coconut bug Amblypelta cocophaga China and induced immature nutfall in the coconut, R. J. A. W. Lever (*Agr. Gaz. [Brit. Solomon Isl.], 3 (1935), No. 4, pp. 9, 10*).—The author's observations appear to incriminate the green coconut bug *A. cocophaga* in the immature nut fall of the coconut.

Histopathology of nerve lesions of cicada after paralysis by the killer-wasp, A. Hartzell (*Contrib. Boyce Thompson Inst., 7 (1935), No. 4, pp. 421–425, fig. 1*).—Adult cicadas of the species *Tibicen pruinosa* Say that were paralyzed by the sting of the killer wasp (*Sphecius speciosus* Dru.) showed nerve lesions in the main parts of the central nervous system when the tissue was stained with 0.1 percent of aqueous toluidine blue, following a technic used in medicine for the detection of paralysis in humans. The lesions exhibited a general similarity to those produced in the nerves of insects killed with triorthocresyl phosphate and with the pyrethrins. Attempts to produce similar paralytic lesions in the yellow mealworm by injections with formic and acetic acids resulted negatively.

Some new species of cicadellian leafhoppers, with food plant notes on others, E. D. Ball (*Biol. Soc. Wash. Proc., 49 (1936), pp. 17–23*).—Six species and one variety, representing the genera *Homalodisca, Cicadella, Graphocephala,* and *Kolla,* are described as new.

Experiments with derris in pea aphid control, J. E. Dudley, Jr., T. E. Bronson, and F. E. Carroll (*Canner, 82 (1936), Nos. 11, pp. 7, 8, 16; 13, pp. 13, 14*).—In greenhouse tests ground derris applied at the rate of from 1.5 to 5 lb. per 100 gal. of water, with a spreader and wetting agent, killed nearly 100 percent of the aphids on the treated plants. The mortality extended over a period of from 3 to 5 days, in which time practically no reproduction occurred.

"Many summer field tests, on both small and large plats, demonstrated that ground derris as a spray, applied at the rate of from 0.25 to 5 lb. per 100 gal. . . ., with a spreader and wetting agent, killed more than 90 percent of the aphids on the treated plants, that from 3 to 5 days were required to obtain the maximum mortality, and that little or no reproduction occurred during that period. These tests further revealed that the application of derris sprays increased the yield of shelled peas approximately 88 percent over that of untreated checks.

"A large number of tests on late planted peas revealed that derris as a spray, with a spreader and wetting agent, applied prior to aphid infestation protected

the plants from appreciable damage for several weeks and resulted in an ultimate infestation considerably lower than had developed in the untreated checks; that heavy applications of derris sprays after the incidence of an infestation protected peas from damage from a commercial standpoint for nearly a month, enabling them to produce a normal crop of pods; that heavy applications of derris sprays with any one of several spreaders and wetting agents, made after the infestation had become heavy, killed approximately 95 percent of the aphids; that derris sprays controlled the aphid more quickly and to a higher degree than did derris dusts; and that concentrations of derris as low as 0.25 to 0.5 lb. . . . per 100 gal., with spreaders and wetting agents, killed approximately as large a percentage of aphids as did 3 lb. per 100 gal."

On the basis of the experiments reported, it appears that sprays of ground derris root containing 0.0044 percent of rotenone, or possibly less concentrations, with a spreader and wetting agent and applied to pea vines while aphids are present in small numbers, give promise of effective control of the pea aphid.

California Aphididae, new cloudy-veined species, E. O. ESSIG (*Pan-Pacific Ent., 11 (1935), No. 4, pp. 156–162, figs. 3*).—Two cloudy-veined aphids of importance in California are described as new, namely, *Micromyzus alliumcepa*, taken on dry onion sets, onion plants, and leek plants at Los Angeles, Woodland, and Oakland, and *M. oliveri*, taken from the common English, or pot marigold (*Calendula officinalis*), at Clovis in Fresno County.

Life history and control of Latania scale on avocado, H. L. MCKENZIE (*Calif. Avocado Assoc. Yearbook, 1935, pp. 80–82*).—This is a practical account of the Latania scale [*Aspidiotus lataniae* Sign.], considered by the author the most important insect enemy of avocado in California, contributed from the California Citrus Experiment Station. Aside from the avocado, which appears to be its primary host, this scale has been found only on *Grevillea thelemanniana*, canna lilies, and gladiolus corms.

The bagworm (Thridopteryx ephemeraeformis Harv.), C. C. HAMILTON (*New Jersey Stas. Circ. 363 (1936), pp. 2*).—A brief practical account of this pest and its control.

The winter moth Hybernia indocilis Walk., A. F. CLARK (*New Zeal. Jour. Sci. and Technol., 17 (1935), No. 3, pp. 541–549, figs. 3*).—An account of the biology and control methods for the native geometrid moth *H. indocilis*, an unprecedented outbreak of which on pine trees took place in 1933 as a result of a succession of very favorable seasons.

Dyar's rule as related to the number of instars of the corn ear worm (Heliothis obsoleta (Fab.)) collected in the field, J. C. GAINES and F. L. CAMPBELL (*Ann. Ent. Soc. Amer., 28 (1935), No. 4, pp. 445–461, figs. 6*).—In this contribution from the Texas Experiment Station and the U. S. D. A. Bureau of Entomology and Plant Quarantine cooperating, the method of determining the number of instars by collection of specimens representing all instars of a brood, measurement of the width of head capsules of the individuals, and classification of the measurements in frequency-distribution diagrams is considered. The limitations of the method, referred to as that of Peterson and Haeussler (E. S. R., 60, p. 560), are pointed out. The application of Dyar's rule for corroborating the number of instars observed in the corn earworm was studied mathematically and is reported upon. The authors do not recommend the use of this rule for corroborating the number of instars observed.

The European pine shoot moth, R. B. FRIEND and H. W. HICOCK (*Natl. Shade Tree Conf. Proc., 11 (1935), pp. 90–96*).—A practical contribution on the status of this introduced pest contributed from the Connecticut [New Haven] Experiment Station.

Progress report on a study of the relation of weather conditions to the development and abundance of the coconut leaf miner and its parasites, S. S. GONZALES (*Philippine Jour. Agr., 6 (1935), No. 4, pp. 365–386, pls. 6*).—In studies of the coconut leaf miner and its parasites, the details of which are given in infolded charts, there was found to be a difference in the degree of infestation between the control and treated groves in which parasites were liberated. It is concluded that the parasites are able to follow their host without man's aid, but such a natural course is so slow that mass liberation is necessary to bring about the speedy restoration of balance between the pest and its parasites.

New methods of codling moth control, L. M. PEAIRS (*Mountaineer Grower, 7 (1936), No. 71, pp. 48–50*).—A brief practical summary.

The codling moth and its control, W. H. BRITTAIN (*Pomol. and Fruit Growing Soc. Quebec, Ann. Rpt., 41 (1934), pp. 45–50*).—This is a brief reference to the codling moth as it occurs in Canada.

Report on the resistance and tolerance of corn varieties tested in 1934, L. H. PATCH and G. T. BOTTGER (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1935, pp. 11, pl. 1*).—The progress in 1934 of an experiment started at Toledo, Ohio, in 1930 and conducted in cooperation with various Federal and State agencies and individual seedsmen is reported upon, the details being given in five tables. The relative resistance of corn strains to borer survival, the increased yields gained by planting strains of corn resistant to the European corn borer, and the tolerance of strains of corn to the corn borer are considered.

Investigations of the varietal resistance of field corn to the European corn borer in 1935, L. H. PATCH and G. T. BOTTGER (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1936, pp. 23, fig. 1*).—Experiments carried on in continuation of the work of the preceding year, above noted, included the following three major phases: (1) Testing the relative borer resistance and tolerance of double-cross hybrid strains of corn, involving inbreds of known tassel emergence characteristics, (2) testing the relative borer resistance of single-cross and miscellaneous 3-way and double-cross hybrid strains of corn, and (3) testing the relative borer resistance of 136 inbred strains of corn.

The details of the work are given in 14 tables and 1 graph.

New midges on pine and grass, E. P. FELT (*Jour. N. Y. Ent. Soc., 44 (1936), No. 1, pp. 7–9*).—A gall midge which killed up to 80 or 90 percent of the foliage of a small white pine at North Stamford, Conn., and was observed on Scotch pine near Bedford, N. Y., is described as new under the name of *Itonida pinifoliae*. A species from *Phragmites communis* in Michigan, also recorded from Ohio, is described as new under the name of *Asteromyia phragmites*.

The biology of autogenous and anautogenous races of Culex pipiens L. (Diptera: Culicidae), P. TATE and M. VINCENT (*Parasitology, 28 (1936), No. 1, pp. 115–145, figs. 5*).—A report is given of a comparative study of an English anautogenous race and three European strains of the autogenous race of *C. pipiens*, conducted over a period of 3 yr. under laboratory conditions.

"With the aid of artificial light during the winter months the anautogenous race has been kept breeding in the laboratory throughout the year for 11 generations without the occurrence of cyclical hibernation (asthenobiosis). Consequently it is suggested that the length of daylight may be a factor of importance in controlling the natural hibernation of females of this race. Females of the English anautogenous race, whether of hibernating or of active generations, laid normally after one blood meal and did not exhibit gonotrophic dissociation. They also oviposited readily after being artificially fed on bird

blood. Unfed females lived for a maximum of 19 days and never accumulated fat body autotrophically. Females, if fed on apple for 5 weeks, accumulated sufficient reserves to enable a small percentage of them to survive 15 weeks of starvation. In the anautogenous race pairing always begins in the air, although it may be completed on the ground. The females do not lay without a blood meal, and they show little tendency to bite man but bite birds voraciously. . . .

"Cross-mating was easily obtained between the two races, autogenous and anautogenous, in both directions, male autogenous + female anautogenous, and male anautogenous + female autogenous. Stenogamy and autogeny are hereditary characters. Stenogamy always appears in the F_1 generation, but autogeny sometimes appears in the F_1 generation and sometimes not until the F_2 generation. Eggs are quickly killed by temperatures below freezing point, and young larvae die within 24 hr. at 0° C. Adults, even hibernating females, die within 4 days at —16°."

A list is given of 47 references to the literature.

The relation of certain fungi to larval development of Eumerus tuberculatus Rond. (Syrphidae, Diptera), D. B. CREAGER and F. J. SPRUIJT (*Ann. Ent. Soc. Amer., 28 (1935), No. 4, pp. 425–437, pl. 1, figs. 5*).—A report is made of a study of the relation of larvae of the lesser bulb fly, the more common of two lesser bulb flies, to the basal rot *Fusarium* and other fungi. The results of the investigation indicate that the larvae of this syrphid require the presence of certain living fungi, together with the bulb media, in order to complete their normal development.

The tarsal chemoreceptor response of the housefly (Musca domestica L.) to sucrose and levulose, C. C. DEONIER and C. H. RICHARDSON (*Ann. Ent. Soc. Amer., 28 (1935), No. 4, pp. 467–474*).—The authors have found in work at the Iowa Experiment Station that the tarsal segments of the housefly are sensitive to solutions of sucrose and levulose. "It is assumed that the responses to the sugars result from stimulation of chemoreceptor organs. An average of about 10 percent of the fly population did not respond even to strong solutions of sucrose. Flies which were permitted to feed gave a lower percentage of response than was given previous to the time of feeding. Starvation increases the percentages of responses to sucrose solutions. Commercial cane sugar and chemically pure sucrose were not significantly different in their effect on the tarsal chemoreceptor response of the housefly. Levulose was less effective than sucrose in stimulating a response of the tarsal chemoreceptors."

The breeding places of Musca domestica in Hungary and the fly control, G. MAKARA (*Kisérlet. Közlem., 38 (1935), No. 5–6, pp. 286–291; Ger., Fr., Eng. abs., pp. 290, 291*).—Observations on the breeding habits of the housefly in Hungary are reported, with a list of 31 references to the literature.

Growth of blow-fly larvae on blood and serum.—II, Growth in association with bacteria, R. P. HOBSON (*Biochem. Jour., 29 (1935), No. 6, pp. 1286–1291, figs. 2*).—In continuation of the author's studies (E. S. R., 71, p. 514) it was found that blowfly larvae (*Lucilia sericata* Meig.) "are able to grow on blood when bacteria are present. Since aseptic larvae fail to develop on blood unless vitamin 'B' is added, the natural flora must supply this vitamin. The site of vitamin synthesis appears to be the food and not the intestine. Blood contains insufficient amounts of phosphorus for the normal growth of larvae. Serum is deficient in both phosphorus and potassium. When phosphate is added, larvae develop on unsterile blood at the usual rate except for a lag in the early stages. Larvae can grow readily on blood infected with pure cultures of various bacilli isolated from the intestine and from blown meat. *B[acillus] coli* proved equally effective."

On a fat-soluble growth factor required by blow-fly larvae, I, II, R. P. HOBSON (*Biochem. Jour., 29 (1935), Nos. 6, pp. 1292–1296, fig. 1; 9, pp. 2023–2026*).—In the first of these studies, Distribution and Properties, muscle oil was found to contain a substance which is essential for the growth of blowfly larvae (*Lucilia sericata* Meig.). "Other sources of the growth factor are, in order of decreasing potency, wool wax, wheat germ oil, egg yolk, cod-liver oil, butter. Olive oil and lard have little or no effect on growth. These results agree with the observations of previous workers on insects, but the distribution of the blowfly factor shows that it is not vitamin A, D, or E. The growth-promoting effects of various substances appear to run parallel with their sterol contents. The active substance is present in the unsaponifiable residue after hydrolysis. There was some evidence that the growth factor possesses also an 'anti-infective' function."

In the second study, Identity of the Growth Factor with Cholesterol, purified cholesterol was found to supply an essential growth factor required by blowfly larvae (*Lucilia sericata* Meig.). "The potency of cholesterol samples of different origin is the same, the minimum active dose being about 0.07 percent of the dry weight of the diet. Ergosterol, lanosterol, and sitosterol also promote larval growth, but are less active than cholesterol. The potency of natural fats and oils can be correlated with their content of cholesterol or sitosterol. It is concluded that the fat-soluble growth factor is the sterol itself. Blowfly larvae do not require fatty acids or fat-soluble vitamins present in the nonsterol fraction of the unsaponifiable residue."

Observations on the sheep blowfly (Lucilia sericata Meig.) in Scotland, F. N. RATCLIFFE (*Ann. Appl. Biol., 22 (1935), No. 4, pp. 742–753, figs. 2*).—It is suggested that a limited temperature tolerance in the early stages of *Calliphora erythrocephala* Meig. is the reason for its not being a serious pest of sheep. A study of the life history and bionomics of *L. sericata* in Scotland is reported.

The effect of low temperature on fruitflies of the genus Anastrepha that attack fruits in Peru [trans. title], J. WILLE (*Min. Fomento, Dir. Agr. y Ganaderia [Peru], Informe No. 30 (1935), pp. 12, fig. 1*).—The experimental exposure of the eggs and larvae (in fruit) and pupae and adults of the West Indian fruitfly, the species of *Anastrepha* of importance in Peru, to a temperature between −1.6° and ±0° C. and a humidity of from 72 to 88 percent gave a mortality of 100 percent when the eggs were exposed for 4 days, the larvae for 7 days, the pupae for 8 days, and the adults for 3 days. It is concluded that exposure to such a temperature for 15 days would insure the destruction of all stages of this fruitfly both inside and outside the fruits, and that many fruits, including grapes, mangoes, and oranges, would not suffer in any way.

The biology and taxonomy of the genus Trichiotinus (Scarabaeidae, Coleoptera), C. H. HOFFMANN (*Ent. Amer., n. ser., 15 (1935), No. 4, pp. 133–209, pls. 2, figs. 8*).—Following a brief introduction to this contribution from the Minnesota Experiment Station a biological discussion is presented, including a review of the literature, the biology of *T. piger* (Fab.) and of *T. assimilis* (Kirby), and rearing technic. The synopsis of the genus *Trichiotinus* which follows includes a historical account and diagnosis of the genus, a key to the species, and a systematic treatise on the species.

A bibliography of 11 pages is included.

The life history of Serica sericea (Ill.) (Scarabaeidae-Coleoptera), C. H. HOFFMANN (*Jour. N. Y. Ent. Soc., 44 (1936), No. 1, pp. 11–15*).—A report from the Minnesota Experiment Station of observations on the biology of *S. sericea* during the course of an outbreak in Anoka County, Minn.

Variations in the seasonal history of the Colorado potato beetle, D. ISELY (*Jour. Kans. Ent. Soc., 8 (1935), No. 4, pp. 142–145*).—The author has found the Colorado potato beetle to be quite definitely single brooded in Arkansas, although every year parts of extra generations, sometimes as many as three, occur. "These variations are significant, since a crop grown after the normal season of occurrence is not necessarily free from attack. Some of the adults reared each year from 1930 to 1932 reproduced during each of the 2 yr. following maturity and passed two winters in hibernation. Some beetles also extended the diapause over 2 yr., maturing in 1932 and reproducing in 1934. This longevity and extended diapause may be of importance in carrying the species through an unfavorable season. Intermittent periods of reproduction and diapause frequently occur during the same season and may extend to the period of attack on its hosts."

Contribution to the history of the Colorado potato beetle in Belgium [trans. title], G. PEETERS and R. COUSTEY (*Agricultura [Louvain], 39 (1936), No. 1, pp. 21–42, pls. 4*).—An extended account of this pest and its occurrence in France and Belgium, in which latter country it was first discovered in July 1935.

Biological studies on the nitidulid beetles found in pineapple fields (Nitidulidae, Coleoptera), C. T. SCHMIDT (*Ann. Ent. Soc. Amer., 28 (1935), No. 4, pp. 475–511, figs. 10*).—In studies conducted by the Hawaiian Pineapple Producers' Experiment Station six species of nitidulid beetles were found in the pineapple fields of Hawaii. Of these, *Carpophilus humeralis* (Fab.) and the dried fruit beetle are the most important, with *C. maculatus* Murr. and *Haptoncus ocularis* (Fairm.) assuming a minor role. *C. dimidiatus* (Fab.) and *H. mundus* Sharp are species of relative rarity.

Experiments on the control of the bronze beetle Eucolaspis brunnea, W. COTTIER (*New Zeal. Jour. Sci. and Technol., 17 (1935), No. 2, pp. 433–453, figs. 2*).—Experimental spraying of the apple, the details of which are presented in tables, is considered to have shown definitely that lead arsenate is intrinsically fully capable of killing *E. brunnea*, but that the type of cover secured is very important.

Temperature and moisture preferences of wireworms, R. E. CAMPBELL (*Bul. Ecol. Soc. Amer., 16 (1935), No. 4, p. 37*).—The habits of wireworms were studied by the author in California in a soil gradient with temperatures ranging from 40° to 100° F. At low temperatures the wireworms became inactive, while temperatures above 90° were unfavorable and they quickly moved out. A moisture of from 12 to 16 percent was found to be the most favorable, dry soil being unfavorable and there being very little activity in wet soil.

Bark-beetle outbreaks and their control: A review of some recent literature, R. N. CHRYSTAL (*Forestry, 9 (1935), No. 2, pp. 124–131*).—This is a brief review of work conducted in the United States, Sweden, and Poland.

The preservation of timber against the attacks of the powder post borer (Lyctus brunneus Stephens) by impregnation with various chemicals, J. E. CUMMINS and H. B. WILSON (*Jour. Council Sci. and Indus. Res. [Austral.], 9 (1936), No. 1, pp. 37–56, figs. 2*).—In the control work with *L. brunneus* successful results were obtained from impregnating pieces of normally susceptible timber with chemicals.

"The successful inorganic chemicals were zinc chloride, sodium fluoride, sodium fluosilicate, and sodium metaborate. Sodium fluosilicate was the most toxic substance, effectively preventing attack at a concentration of 0.024 lb. per cubic foot. Promising results have been obtained with certain organic chemicals, viz, the chlorinated naphthalenes and organic mercurials such as Lignasan.

With the organic compounds, further tests are needed before the relative values of these substances as preservatives against *Lyctus* beetles can be accurately estimated. Two methods of testing have been described, one using larvae and the other beetles. The larval test does not give satisfactory results and does not allow of the ready evaluation of various chemicals for *Lyctus* control. The beetle test appears to be very satisfactory, and the concentrations of chemicals which inhibit *Lyctus* infestation have been found to be very low. It is believed that these concentrations would be effective under normal conditions of infestation."

The identity of the cotton stem weevil and parasites of the caterpillar of Cosmophila and the common mealy bug, F. Q. OTANES (*Philippine Jour. Agr., 6 (1935), No. 4, pp. 503, 504*).—A serious enemy of cotton in the Philippines, referred to by the author in a previous account (E. S. R., 74, p. 229), is said to have been identified as *Pempheres affinis* Faust. It is pointed out that this weevil also occurs in India, being a rather serious enemy of cotton in Coimbatore. The parasite of the caterpillars of *Cosmophila erosa* Hubn. described and referred to as *Euplectrus* sp. has been identified as *E. manilae* Ashm. Three species of parasites of the common mealybug *Ferrisia virgata* Ckll. have been identified as *Leptomastix longipennis* Mercet, *Holanusomyia pulchripennis* Gir., and *Blepyrus insularis* Ashm.

Some observations from life history of the poppy-weevil Ceutorhynchus macula alba Hrbst., G. I. SZELÉNYI (*Kisérlet. Közlem., 38 (1935), No. 5–6, pp. 217–224, figs. 2; Ger., Eng. abs., pp. 223, 224*).—A study of the biology and control of *C. macula alba*, the most injurious insect of the poppy in Hungary, is reported. In the control of this weevil derris, when applied in the blooming period, was quite effective. The application of raw naphthalene to the flowers before blooming was of doubtful value.

Experimental studies regarding the influence of temperature and relative humidity on the oviposition of the rice weevil (Calandra oryzae L.), P. H. TSAI and Y. N. CHANG (*Agr. Sinica, 1 (1935), No. 6, pp. 175–188, figs. 5; Eng., pp. 175–183, Chin., pp. 184–188*).—The studies reported have led to the conclusion that outbreaks of the rice weevil can be eliminated entirely either by maintaining a storage temperature below 10° C. or above 35° or by maintaining a humidity of less than 60 percent.

New Indian Curculionidae (Col.), G. A. K. MARSHALL (*Indian Forest Rec., n. ser., 1 (1936), No. 11, pp. 205–231, pl. 1*).—Twenty reared curculionids are described as new, two genera being erected.

Studies on European foul brood of bees.—I, A description of strains of Bacillus alvei obtained from different sources and of another species occurring in larvae affected with this disease, H. L. A. TARR (*Ann. Appl. Biol., 22 (1935), No. 4, pp. 709–718, pl. 1*).—Contributing from the Rothamsted Experimental Station and the Lister Institute of Preventive Medicine, the author reports upon an unidentified bacillus which appears to replace *B. alvei* in certain cases of European foulbrood, it having been isolated from two cases of the disease. Strains of *B. alvei* from various sources have been found to exhibit certain differences in their fermentative powers, and it is suggested that these may form a basis for their differentiation.

The etiology of European foulbrood is discussed, and a list is given of 22 references to the literature.

Stylops melittae as a bee enemy, A. G. BELJAVSKY (*Bee World, 17 (1936), No. 3, pp. 32, 33, figs. 5*).—A brief account is given of *S. melittae*, which lives as a parasite on bees of the genus *Andrena* and sometimes on the honeybee.

An apparent correlation between the feeding habits of certain pteromalids and the condition of their ovarian follicles (Pteromalidae, Hymenoptera), S. E. FLANDERS (*Ann. Ent. Soc. Amer., 28 (1935), No. 4, pp. 438–444*).—Observations at the California Citrus Experiment Station of certain parasitic Hymenoptera, particularly the pteromalids *Dibrachoides*, *Peridesmia*, *Spintherus*, and *Eutelus*, show that "when the ovarian follicles reach a certain stage of development a change occurs in the food habits of the female. In the laboratory this change was from a diet of only cane sugar sirup or of honey to a protein diet consisting of the body fluids of the host species. After the beginning of the period of egg deposition, a certain amount of carbohydrates appears to be needed in addition to the host's fluids.

"When environmental conditions inhibit oviposition, the ovarian follicles and the eggs apparently disintegrate and are absorbed and the parasite reverts to a purely carbohydrate diet. (In *Peridesmia* this may occur within 3 weeks after the first change in diet.) This absorption of the contents of the ovaries (except the primary cells in the germarium) may also occur in females that did not develop a need for the host's fluids.

"A period of 'phasic castration' follows, which may last as long as 9 mo. at temperatures between 65° and 80° F. The end of this period is apparently synchronized with the appearance in the field of the susceptible stage of the host."

Host influence on the prolificacy and size of Trichogramma, S. E. FLANDERS (*Pan-Pacific Ent., 11 (1935), No. 4, pp. 175–177*).—A report is made of observations of the reproduction of *T. evanescens* and *T. embryophagus*.

Apanteles tasmanica Cam.: A braconid parasite of leaf-roller larvae, L. J. DUMBLETON (*New Zeal. Jour. Sci. and Technol., 17 (1935), No. 3, pp. 572–576, figs. 10*).—An account of the most important parasite (*A. tasmanica*) of the apple leaf roller *Tortrix postvittana* Walk. in New Zealand.

The biology of Coeloides dendroctoni Cushman (Hymenoptera—Braconidae), an important parasite of the mountain pine beetle (Dendroctonus monticolae Hopk.), D. DE LEON (*Ann. Ent. Soc. Amer., 28 (1935), No. 4, pp. 411–424, fig. 1*).—This contribution relates to the most important parasite of the mountain pine beetle in lodgepole pine in western Montana and western white pine in eastern Washington and Idaho. It is not known to attack the mountain pine beetle in western yellow pine. Average parasitism ranged from about 4 to 32 percent, depending on the age of the infestation, but in individual trees it frequently reached 90 percent.

"The life cycle of *C. dendroctoni* Cush. ranged from about 4 weeks to nearly a year. The principal emergence of the parasite and parasitism of the brood of the mountain pine beetle occurred during June. Most of the parasitic larvae overwintered, but some pupated immediately after feeding was finished and emerged during July and August. There was also some parasitism of the brood of the beetle during August and September. Descriptions of the developmental stages and notes on the habits of the adults are given.

"Two secondary parasites, *Eurytoma* n. sp. and *Gelis* sp., were reared from the cocoons of *C. dendroctoni* Cush. in Montana. No secondary parasites were found in eastern Washington."

The bionomics of the rose sawfly Arge victorina Kirby (Hymenoptera: Argidae), with notes on other injurious tenthredinoid larvae in Kwangtung, W. E. HOFFMANN (*Lingnan Sci. Jour., 15 (1936), No. 1, pp. 101–112, pl. 1; Chin. abs., p. 112*).—An account of *A. victorina*, a serious pest of roses in the Canton area, is followed by notes on eight other species, the larvae of which are described with notes on their bionomics.

The European spruce sawfly outbreak in 1935, R. E. BALCH (*Canad. Ent., 68 (1936), No. 2, pp. 23–31*).—In this further contribution on *Diprion polytomum* Htg. (E. S. R., 73, p. 206) the pest is said to have spread somewhat in all directions from the heavily infested area of the interior of the Gaspé Peninsula, Province of Quebec, where serious defoliation was discovered in 1930. The area on which the spruce has lost the greater part of its foliage now approaches 6,000 sq. miles, as compared with about 4,000 in 1933. It extends, roughly, to the Matapedia Valley on the west, to the St. Lawrence shore on the north, and to within 10 to 20 miles of the Chaleur Bay on the south West of this a small area of a few square miles occurs in Kamouraska County.

The alien element in the British sawfly fauna, R. B. BENSON (*Ann. Appl. Biol., 22 (1935), No. 4, pp. 754–768*).—An account is given of the introduced sawflies, which include 30 of some 400 known to occur in the British Isles.

The control of plum sawfly, with a note on thrips damage, F. R. PETHERBRIDGE and I. THOMAS (*Jour. Min. Agr. [Gt. Brit.], 42 (1936), No. 11, pp. 1108–1118, pls. 2*).—In experimental control work with *Hoplocampa flava* L. two sprayings with derris used at the rate of 0.8 lb. of derris, 5 oz. of spreader, and 40 gal. of water gave rather better results than did the application of nicotine sulfate with lead arsenate. "Spraying at the time when the 'cots' were beginning to split gave better results than spraying a week later. Nicotine sulfate (without lead arsenate) gave only a moderate control. Lead arsenate (without nicotine sulfate) gave a poor control. One dusting with a derris dust (0.2 percent rotenone) was not satisfactory. Three dustings with 30 percent naphthalene reduced the infestation, but as this does not kill it probably drives the sawflies to other trees."

Injury caused by the pear thrips to unsprayed plums, in which small lumps and a roughening of the skin of young fruits occurred, was reduced in 1933 from 27.5 to 1.7 percent by the application of nicotine sulfate and lead arsenate. The injury to Damsons in 1935 is said to have been reduced from 43 percent on unsprayed trees to 29 percent on trees sprayed with nicotine sulfate.

The black widow, W. J. BAERG (*Arkansas Sta. Bul. 325 (1936), pp. 34, figs. 9*).—An account is given of this venomous spider, its morphology, biology, etc., based upon a review of the literature, observations, and experiments conducted by the author. The effects of its bite upon laboratory animals and man, with the clinical history of cases, are reported.

In a summary of extermination methods it is pointed out that kerosene as a spray is effective if brought into contact with the spiders. Creosote oil is likewise effective in killing, but as a repellent its effect is of short duration. Calcium cyanide dust may be used to reduce the population in wood piles and rock walls, killing about 75 percent of the spiders or more if thoroughly applied.

A plate which shows the color markings of this spider and also of the jumping spider, *Phidippus insolens*, and a list of 45 references to the literature are included.

Experimental studies on Latrodectus mactans (the black widow), MRS. N. MILLER (*Jour. Ent. and Zool., 27 (1935), No. 4, pp. 66–90, figs. 4*).—A study of the black widow spider (*L. mactans*) collected at Porterville, Calif., is reported.

The citrus rust mite and its control, S. W. CLARK (*Ann. Tex. Citrus Inst. Proc., 8 (1934), pp. 67–69*).—A brief account of the citrus rust mite, which has become increasingly serious in the Texas citrus area, contributed from the Texas Experiment Station.

The seasonal occurrence of harvest mites (Trombicula autumnalis Shaw) on voles and mice near Oxford, C. ELTON and G. KEAY (*Parasitology, 28 (1936), No. 1, pp. 110–114, fig. 1*).—Monthly examinations of three rodents in Bagley Wood near Oxford, namely, *Apodemus sylvaticus* L., *Clethrionomys* (=*Evotomys*) *glareolus britannicus* (Miller)), and *Microtus agrestis hirtus* (Bellamy), for the presence of parasites over a period of 21 mo. have shown *T. autumnalis* larvae to infest all three species during the summer and autumn months and *C. glareolus* throughout the following winter and spring. *C. glareolus* and rabbits (*Oryctolagus*) are said to have been of importance in maintaining the stock of *T. autumnalis* in the south of England. The mites occupy different positions on different hosts.

A short synopsis of the North American species of the mite genus Dermanyssus, H. E. EWING (*Ent. Soc. Wash. Proc., 38 (1936), No. 8, pp. 47–54, fig. 1*).—The author recognizes seven species of mites of the genus *Dermanyssus* as occurring in the United States, of which the chicken mite recently found on certain wild birds is the most important. Of these, two are described as new, namely, *D. scutatus*, from the northwestern flicker (*Colaptes cafer cafer*) at Corvallis, Oreg., and *D. brevis*, from the dusky-horned lark (*Otocoris alpestris merrilli*) at Portland, Oreg.

ANIMAL PRODUCTION

[Investigations with livestock in Hawaii] (*Hawaii Sta. Rpt. 1935, pp. 21–23*).—The results of tests with beef cattle are noted on fattening steers on locally produced feed mixtures made up of pigeonpea hay meal, corncob and husk meal, and cane molasses.

With swine, information was obtained on the feeding value of bananas, cassava meal and soybean oil cake meal, raw sweetpotatoes, and sprouted oats for sows.

Poultry tests produced results on plantation back yard poultry houses, batteries for laying and breeding stock, artificial illumination for laying stock, tree kale as a source of green feed for poultry, and the relation of relative humidity to size of air cell and hatchability of eggs.

Animal breeding and nutrition (*Maine Sta. Bul. 380 (1935), pp. 187–203, figs. 5*).—This progress report discusses further (E. S. R., 73, p. 273) the "climate-soil-plant-animal-man" interrelationships as applied to the problem of food-getting in both animals and man, by W. F. Dove, and psychosocial and economic factors in nutrition, also discussed elsewhere (p. 389). Data obtained in experiments with livestock are also reported on nutritional deficiency diseases of dairy cattle and in the domestic fowl and on food preference as a guide in nutrition studies.

[Investigations with livestock in Ohio] (*Ohio Sta. Bul. 561 (1936), pp. 79–83, 84–88, 102, 103, 104, 123–125, figs. 3*).—The results obtained in tests with beef cattle are reported on the relative profitableness and efficiency of steer and heifer calves and steer yearlings, by P. Gerlaugh and C. W. Gay; corn-and-cob meal v. shelled corn for yearling steers and steer calves, by Gerlaugh and H. W. Rogers; and the addition of protein supplement to a full feed of corn on pasture, quantity of supplement for fattening calves, both by Gerlaugh; and effect of mechanical processing of alfalfa hay on digestion, by E. A. Silver.

Swine experiments yielded results on corn distillers' dried grains for fattening pigs, hydraulic and expeller cottonseed meal for pigs, old process, or hydraulic, and expeller linseed meal for pigs, adding dried skim milk to the trio supplemental mixture for pigs, and effect of hulled oats on the skeletal

and muscular development in pigs, all by W. L. Robison; methods of determining the calcium requirement of pigs, by C. H. Kick, R. M. Bethke, and O. H. M. Wilder; and different types of tankage for pigs without pasture, by Robison and R. C. Beatty.

With sheep studies, information was obtained on the calcium, phosphorus, and vitamin D requirements of lambs, and young lamb and ewe feeding experiments with timothy hay, by D. S. Bell and Kick.

Poultry studies produced data on the vitamin G (complex) requirements of the chick, by C. H. Hunt, P. R. Record, and Bethke; vitamin A requirements of growing chicks, by Record, Bethke, and Wilder; relation of the vitamin G complex to hatchability of hens' eggs, by Bethke and Record; housing and labor-saving equipment for poultry, and five years' management tests with chicks and pullets, by D. C. Kennard and V. D. Chamberlin.

Nutrition studies yielded data on the quality of hays from different grasses, by Hunt, Robison, and Bell; and on the provitamin D of plant and animal sources, by Bethke, Record, and Wilder.

A study of individuality in the nutritive instincts and of the causes and effects of variations in the selection of food, W. F. Dove (*Amer. Nat., 69 (1935), No. 724, pp. 469–544, figs. 12; abs. in Maine Sta. Bul. 380 (1935), pp. 250–252*).—A report is presented from the Maine Experiment Station on the nature of the genetics and physiology of nutritive instincts in experiments with chicks on free-choice diets with seven feeds, with corroborative data from experiments with rats.

A study of the rations consumed indicates that the nutritive instincts in choice of food vary with the individual but are based on the demands of the organism, although such may be modified by imitation, habit, etc. Equational expressions of choice of nutrients and genetic response are suggested as a basis for analysis of the complementary action of foods and determination of the nutrients best adapted to each new genotypic complex to restrict or stimulate development in man and animals.

Can live stock be raised profitably in Alabama? G. W. Carver (*Alabama Tuskegee Sta. Bul. 41 (1936), pp. 12*).—In this bulletin the author points out the place of livestock in Alabama agriculture, presents methods for producing pastures, gives information on crops suitable for livestock, and suggests rations for use in feeding different classes of livestock.

Market classes and grades of lambs and sheep, L. B. Burk, C. E. Gibbons, and M. T. Foster (*U. S. Dept. Agr. Circ. 383 (1936), pp. 35, figs. 15*).—This circular describes the standard classes and grades for sheep and lambs and discusses the need for such standardization. The basis of classification and the definitions and descriptions of market grades are discussed, together with the factors affecting grade and value. Schedules are presented showing how lambs and sheep are segregated into market classes according to classes, subclasses, ages, weights, and grades.

Rye as a feed for poultry, J. G. Halpin, C. E. Holmes, and E. B. Hart (*Poultry Sci., 15 (1936), No. 1, pp. 3–8*).—A series of four feeding trials with chicks and two with pullets at the Wisconsin Experiment Station showed that rye was an unsatisfactory feed for young chicks. However, it could be used in the mash for growing pullets and laying hens. In sections where rye is grown it may be used to advantage for the latter types of birds, but it probably would not be profitable to purchase rye for poultry feeding.

A study of mean egg weight when grain is hopper-fed, T. B. Clark (*Poultry Sci., 15 (1936), No. 1, pp. 27, 31*).—The results for this study at the West Virginia Experiment Station were secured from a series of feeding trials in

which limited and unlimited amounts of whole grain supplemented certain mash mixtures. The grain used consisted of corn and oats. In the pens receiving unlimited grain the protein level of the ration was lowered and the proportion of vegetable protein increased due to the greater consumption of whole grain. The mean egg weights did not vary significantly between pens. This indicated that the small difference in quantity and quality of protein did not influence the mean egg weights.

Growth of chick embryos from hens fed different protein levels, R. PENQUITE and R. B. THOMPSON (*Poultry Sci., 15 (1936), No. 1, pp. 18, 66*).—At the Oklahoma Experiment Station the growth of embryos from two lots of hens fed at different protein levels were compared under the same conditions.

The embryos from the high protein lot were heavier between the seventh and seventeenth days than those from the low protein lot. However, an analysis of the variance for this period showed a greater variation within the groups than between the groups, indicating that the difference was insignificant. There was also a greater variation within than between the groups when the total nitrogen of the embryo was considered. Although the embryos from the high protein group were heavier during the greater part of the incubation period as shown by both wet weight and dry weight the differences were not significant, but because this difference existed the authors suggest that studies with a larger number of embryos might yield significant values.

The phosphorus requirements of growing chickens, with a demonstration of the value of controlled experimental feeding, W. E. WATKINS and H. H. MITCHELL (*Poultry Sci., 15 (1936), No. 1, pp. 32–41*).—The Illinois Experiment Station fed eight pairs of cockerels on rations containing 0.26 and 0.5 percent of phosphorus and a similar eight pairs on rations containing 0.5 and 0.83 percent of phosphorus. The basal ration was adequate in all other respects, and the pair mates received the same amount of feed. At the termination of the 5-week feeding period the surviving birds were killed and one of the tibia removed from each carcass for analysis.

It was found that the greater the consumption of a rachitogenic diet, the slower was the rate of bone calcification. In general it appeared that the greater the consumption of a diet unbalanced in some particular, the poorer nourished was the animal with reference to the function with respect to which the ration was unbalanced. For the most exact comparison of rations either of which was unbalanced with respect to a nutrient, the equalization of the food index of comparative experimental animals was essential. There appeared to be no reason to believe that the outcome of such a comparison would depend upon the level of food intake of the various pairs of experimental animals. The only effect of a low as compared with a high intake of food was that the lower intake took longer to manifest itself.

This study showed that chicks in the self-inhibiting phase of growth required more than 0.26 percent but no more than 0.5 percent of phosphorus in the ration for maximum growth and bone calcification.

Vitamin A storage by chickens, A. D. HOLMES, F. TRIPP, and P. A. CAMPBELL (*Poultry Sci., 15 (1936), No. 1, pp. 71–78*).—This study was undertaken to determine the vitamin A content of the livers of growing chicks and laying hens.

A significant individual variation was obtained in the assay of livers of typical 8-week-old chicks. The average vitamin A content of the livers of chicks which received 0.5 percent of sardine oil was about four times greater than that of livers from chicks which received 0.25 percent of oil. In 12-week-old chicks the vitamin A content of the livers was significantly higher for

those which received 0.5 percent of oil. In a second test, the size of the chick at 8- and 12-week periods and the vitamin A content of the livers from the different pens varied with the amount of vitamin A consumed. Regardless of the amount of oil fed, the livers of 12-week-old chicks contained more vitamin A than the livers from comparable 8-week-old chicks. From this it was assumed that chicks increased their liver reserve of vitamin A during the period of observation.

There was a variation in the vitamin A content of the livers of 21 fall-hatched, 9-month-old pullets. The number of eggs produced by the different groups increased with the amount of oil in the rations, although none of the pullets showed evidence of vitamin A deficiency. A wide variation was found in the amount of vitamin A stored in the livers of 15-month-old hens of good size and in good physical condition. The vitamin A content of the liver of the highest producing birds was larger than for the majority of the birds producing the fewest eggs. These results indicated that high-producing flocks fed rations rich in vitamin A can maintain an adequate supply of the factor through the reproduction period.

The hemoglobin content of the blood of laying hens on practical poultry rations, M. O. SCHULTZE, C. A. ELVEHJEM, E. B. HART, and J. G. HALPIN (*Poultry Sci., 15 (1936), No. 1, pp. 9–13, figs. 2*).—The Wisconsin Experiment Station undertook a study to establish with hens fed a practical poultry ration the effect of egg production on the hemoglobin content of the blood and the effect of added iron and copper on both.

The practical ration used supplied about 14 mg of iron and about 0.5 mg of copper per hen per day. This ration could support heavy egg production without lowering the hemoglobin content of the blood. Adding iron and copper to this ration failed to raise either the hemoglobin content of the blood or the egg production. There was no evidence of anemia in the healthy non-infected laying hens used, but it is pointed out that these results may not be applicable to commercial flocks where a variety of infections may exist.

Hemoglobin regulation in chickens, I. W. HARMON (*Poultry Sci., 15 (1936), No. 1, pp. 53–62*).—An investigation at the California Experiment Station was planned to find explanations for the wide variations in hemoglobin levels that have been observed previously. This study dealt with the nonnutritional factors involved. A total of 15,000 hemoglobin determinations of the blood of 3,000 chicks was made over a 3-yr. period.

The results showed that the hemoglobin level was high at the time of hatching and at maturity and lowest at 2 weeks of age in the case of chicks fed all-mash rations. While no significant difference due to sex was found up to 8 weeks of age, mature cocks had a distinctly higher level than mature capons, and capons higher than hens. A splenic reserve of hemoglobin was found in capons, hens, 10-week-old cockerels, and pullets, but none in mature cocks or broody hens. While egg production decreased hemoglobin levels, high-producing hens had higher levels than low producers both when laying and when not laying. The level of hemoglobin rose rapidly with the onset of broodiness and cessation of egg production. Surviving hens and chicks had higher levels of hemoglobin than those that died, and the level was high in the lots in which mortality was low. "Bleeder" chicks had longer bleeding and blood-coagulating time and a much lower hemoglobin level, but their blood had a higher content of plasma proteins and uric acid than normal chicks.

The vitamin D content and hemoglobin building properties of dehydrated kelp for chicks, M. W. MILLER and G. E. BEARSE (*Poultry Sci., 15 (1936), No. 1,*

pp. 19–22, fig. 1).—For this study at the Western Washington Experiment Station nine lots of 20 chicks each were fed. Lots 1 to 3, inclusive, received a vitamin-D-deficient diet, lots 4 to 8 the Washington State College chick-starting ration, and lot 9 a ration recommended by the manufacturers of Manamar. In addition to the basal rations, the following supplements were used—none, ⅛ percent of concentrated cod-liver oil, 5 percent of kelp, ⅛ percent of cod-liver oil, 2½ percent of kelp, 5 percent of kelp, ⅛ percent of cod-liver oil and 2½ percent of kelp, ⅛ percent of cod-liver oil and 5 percent of kelp, and 10 percent of Manamar. The feeding period lasted 8 weeks.

The sample of dehydrated kelp used in this trial contained little, if any, vitamin D, nor did it increase the hemoglobin value of the blood of chicks on a normal ration. The rations supplemented with kelp and cod-liver oil were not superior to that in which cod-liver oil alone was fed. The Manamar ration used in this trial prevented rickets.

Availability of calcium salts for bone formation and rickets prevention in chicks, H. J. Deobald, C. A. Elvehjem, E. B. Hart, and J. G. Halpin (*Poultry Sci., 15 (1936), No. 1, pp. 42–47*).—The Wisconsin Experiment Station made a study of the effect of limited vitamin D intake on the availability of various calcium salts for growth and bone formation in chicks. In three experiments chicks were fed a basal rachitogenic ration supplemented with a variety of common calcium salts and varying levels of cod-liver oil.

The ash content of the fat-free bone was higher when the supplement contained phosphorus in conjunction with calcium. The calcium of the salts tested appeared to be equally available for bone formation in spite of differences in solubility of the supplements. When the levels of cod-liver oil added to the ration were critical, the soluble salt calcium lactate produced better growth and bone formation than the insoluble salt precipitated calcium silicate. This difference was not apparent when the cod-liver oil levels were higher. The availability of insoluble calcium silicates was proportional to their solubility in dilute acid, and increasing the level of cod-liver oil had no effect on the availability of the calcium in such compounds.

Menhaden oils as an antirachitic supplement for poultry, W. C. Supplee and C. F. Lee (*Maryland Sta. Bul. 389 (1935), pp. 421–426*).—In cooperation with the U. S. Bureau of Fisheries, a study was conducted to determine the value of menhaden oils as a source of vitamin D for use in poultry feeding.

Four samples of menhaden oil were tested at levels of 0.5, 1, and 1.5 percent. Normal bone ash averages were obtained with three of the samples at the lowest level, while the fourth gave a slightly subnormal content at the 0.5-percent level. Subsequently three other samples were tested at 0.25-, 0.5-, and 1-percent levels, a fourth sample at 0.25- and 0.5-percent levels, and a fifth at 0.5- and 1-percent levels. All of these samples were sufficiently rich in vitamin D to provide for normal calcification at the lowest level tested. The average potency of various brands of cod-liver oils used in poultry feeding was adequate to produce normal calcification by the method used at from 0.25- to 0.5-percent levels. There was considerable variation in the vitamin D potency of the oils carrying this factor. There were also indications that menhaden oils of higher quality could be produced by modifications of the method of refining.

A new factor, not vitamin G, necessary for hatchability, R. B. Nestler, T. C. Byerly, N. R. Ellis, and H. W. Titus (*Poultry Sci., 15 (1936), No. 1, pp. 67–70*).—In order to determine whether vitamin G was a necessary factor for improving certain deficient diets to promote good hatchability, a study was made of data obtained at the U. S. D. A. Beltsville Research Center. These

data were obtained from pens of chickens used over a 3-yr. period in an extensive study of the nutritional factors affecting hatchability.

It was found that a basal feed mixture composed of 52.6 percent of ground yellow corn, 25.8 percent of pure wheat bran, 15.8 percent of rolled oats, and 5.8 percent of alfalfa leaf meal contained at least enough vitamin G to meet the minimum requirements of chickens for hatchability. However, the ration lacked some other factor necessary for high hatchability which was relatively abundant in dried pork liver meal and green grass, and present to some extent in a mixture of desiccated meat meal, N. A. fish meal, and dried buttermilk. Dried whey apparently was not a good source of the factor, as no material increase in hatchability resulted from its addition to the two types of diets studied.

A pedigree index for valuing poultry pedigrees, M. O. NORTH (*Poultry Sci., 15 (1936), No. 1, pp. 52, 62, 70, fig. 1*).—In this paper from the Wyoming Experiment Station a pedigree index for determining the breeding worth of an individual or family is described and illustrated. The formulas used in the calculation of the individual and family indexes are presented.

The use of certain characteristics for estimating egg production, C. W. KNOX and J. P. QUINN (*Poultry Sci., 15 (1936), No. 1, pp. 28–31*).—A study was made with 228 White Leghorns at the U. S. D. A. Beltsville Research Center to determine whether any of 18 characters used by poultrymen in estimating a hen's egg production were of value in this respect.

Of the characters studied only quality of shanks and quality of pubic bones showed no appreciable correlation with egg production. There was a fairly significant correlation between body depth and egg production, while the other characters all showed a highly significant correlation. The multiple correlation coefficient, 0.494, was not significantly different from the highest simple correlation coefficient of —0.448 between shank color and egg production. Of the characters studied, shank pigment, molt, head quality, abdomen quality, width of back, and comb and eye quality gave a multiple correlation of 0.49 with egg production.

Multiple turning and orienting eggs during incubation as they affect hatchability, M. W. OLSEN and T. C. BYERLY (*Poultry Sci., 15 (1936), No. 1, pp. 88–95, figs. 4*).—A 2-yr. study was conducted at the U. S. D. A. Beltsville Research Center to determine the effect of orienting and turning eggs during incubation on hatchability. The eggs used were carefully selected to eliminate variations due to the breeding and management of the adult birds and storage conditions previous to incubation.

It was found that eggs could be turned as often as 96 times daily during incubation without detrimental results if they were rotated back and forth about their long axes and tilted up and down about their short axes. When turned in this manner at 15- and 30-min. intervals eggs hatched 6.8 and 7 percent better than the controls which were incubated horizontally and turned 3 times daily in a hit-and-miss fashion. Turning eggs 96 times daily in one direction about their long axes caused high embryonic mortality, and many of the deaths were due to ruptured blood vessels and broken yolk sacs.

Holding the small ends of the eggs down during incubation decreased the malpositions head-in-small-end about 7 percent and head-away-from-air-sac about 2 percent. Eggs turned in a mechanical tray 3 times daily by means of a crank instead of a motor showed no improvement over the controls in hatch, indicating that gentleness of turning may be a factor in hatchability. After the first 2 weeks turning eggs 96 and 48 times daily was of questionable value.

Seasonal variations in egg quality, F. W. LORENZ and H. J. ALMQUIST (*Poultry Sci., 15 (1936), No. 1, pp. 14–18*).—Studies on the quality of eggs laid during the entire year were made with two flocks of birds at the California Experiment Station. It was proposed to determine whether there was a real deterioration of eggs produced in the summer at or prior to the time they were laid or whether the deterioration occurred because such eggs were exposed to high temperatures after they were laid. An attempt was also made to discover whether differences in season should be considered when interpreting the results of egg quality studies, particularly with reference to measurement of percentage of firm white, egg weight, and shell weight.

An increased air temperature during the formation of the egg decreased the egg weight but had no effect on the percentage of firm white or shell weight. The percentage of firm white was lowered by higher air temperatures immediately after laying, producing an apparent seasonal variation in the internal fluences candling, and is more rapid than methods which require breaking the egg.

An external measure of egg viscosity, H. L. WILCKE (*Iowa Sta. Res. Bul. 194 (1936), pp. 71–103, figs. 4*).—In this investigation a new method involving the use of a torsion pendulum was developed for use in egg viscosity studies which provides a measure of the combined viscosity of all the components of the interior of the egg. It largely eliminates the human element, which influences candling, and is more rapid than methods which require breaking the egg.

A close correlation was found between the weight and K (constant of the combined viscosities) value for eggs. The rations used did not affect the K values of the eggs. The index was a characteristic of the individual hen. The correlations between total egg viscosity and percentage, volume, or viscosity of thin white were low and not significant. The same was true of the correlation between total viscosity and volume of thick white. The K values of the eggs from inbred birds were less variable than those of noninbred birds. However, there was a distinct difference in the values between inbred sisters.

What is a "watery" egg? J. L. ST. JOHN (*Poultry Sci., 15 (1936), No. 1, pp. 79–82*).—The data presented in this paper from the Washington Experiment Station indicate that the earlier assumption that "wateriness" of egg whites is correlated with the ration of thin-to-thick white is incorrect.

The operative removal of the yolks from newly-hatched chicks, H. J. SLOAN (*Poultry Sci., 15 (1936), No. 1, pp. 23–27, figs. 4*).—This paper from the Illinois Experiment Station describes a procedure for the operative removal of the yolk material from newly hatched chicks. A small incision was made in the ventral wall of the abdomen, the yolk stalk was cut and cauterized, and the incision closed with thread sutures. The effects of this operation were apparently not severe, for mortality was low and growth normal after the sixth week. It is believed that the procedure would simplify vitamin studies with chicks in so far as they are complicated by vitamins present in the yolk.

Protein requirements for finishing turkeys, F. E. MUSSEHL and C. W. ACKERSON (*Nebraska Sta. Bul. 298 (1936), pp. 8, figs. 4*).—A series of three experiments was undertaken to determine the best adapted protein levels for the "finishing" ration for turkeys. Young toms were fed in two experiments and young hens in the third, each of which lasted 6 weeks. A 16.24-percent protein level was compared with 21.04 percent in the first experiment and 14.54 and 18.3 percent in the last two tests. The lower levels were as efficient in each experiment as the higher levels and were much more economical.

The value and use of three mash formulas are discussed.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle in Hawaii] (*Hawaii Sta. Rpt. 1935, pp. 20, 21*).—Results of feeding tests to determine the value of pineapple bran, cassava meal and coconut oil cake, pineapple bran and cane molasses, and green alfalfa v. green Sudan grass, and green Sudan grass v. green Napier grass as soiling crops for dairy cows are briefly noted.

[Investigations with dairy cattle and dairy products in Ohio] (*Ohio Sta. Bul. 561 (1936), pp. 69–78, 84, 101, 102, figs. 2*).—Tests with dairy cattle and goats yielded results on the use of mineral acids for the preservation of forage, by C. C. Hayden, A. E. Perkins, W. E. Krauss, C. F. Monroe, R. G. Washburn, and C. E. Knoop; fish meal for the dairy ration, by Monroe and Krauss; a home-grown dairy ration, by Monroe and L. E. Thatcher; wheat as a pasture crop, by Monroe, Thatcher, and Hayden; the value of iron and copper in normal calf rations, by Knoop, Krauss, and Washburn; producing oestrum in goats during the anoestrum period, by T. S. Sutton; the efficiency of a nonsilage ration for milk production, by Monroe and W. Mahan; and Sudan grass compared with alfalfa pasture for dairy cows, by Perkins, W. E. Weaver, and C. Fryman.

With dairy products results were obtained in studies on irradiated milk, by Krauss and R. M. Bethke; antirachitic efficiency of irradiated milk, yeast milk, and cod-liver oil, by Bethke, Krauss, and P. R. Record; the growth-promoting value of raw v. pasteurized milk, and total nutritive effect of pasture milk and dry-feed milk, both by Krauss; carotene for coloring butter, by Sutton and [R. B.] Stoltz; and the influence of the feed of the cow upon the vitamin G (complex) content of the milk, by C. H. Hunt, Krauss, and Monroe.

The effect of pregnancy and parturition on the weight of dairy cows, R. F. Morgan and H. P. Davis (*Nebraska Sta. Res. Bul. 82 (1936), pp. 23, figs. 4*).—A study was made of the effect of pregnancy and parturition upon the weight cycle of Ayrshire, Guernsey, Holstein, and Jersey dairy cows. The data were based on a total of 656 separate gestation periods, during each of which the animals were weighed on three consecutive days the middle of each month and at daily intervals beginning on the two hundred and sixty-fifth day of pregnancy and continuing for 30 days after calving.

The analyses showed a progressive monthly gain in weight from conception to parturition. For the first gestation of all breeds these gains were approximately equal each month, while for succeeding gestations the monthly gains proceeded rather evenly for the first 4 mo., and then the curve of gain started to bend upward and continued bending upward until parturition. The monthly gains were largest for the first gestation and tended to decrease in succeeding gestations. The gain in weight during pregnancy was approximately one-third of the initial weight of the cow at conception for each breed during the first gestation, but for mature cows it was approximately one-seventh of the initial weight. The average weight of cows of each breed for 12 mo. showed a progressive increase up to the fourth gestation, when it tended to become stabilized.

The total weight losses due to calving during the first gestation for all breeds averaged about one-eighth of the initial weight of the cow, but for mature animals averaged about one-eleventh of the initial weight. During the first gestation the total weight lost at calving averaged about one-third of the total gain during pregnancy, while for mature gestations the loss varied from one-half to seven-tenths of this gain. First-gestation calves averaged about one-twelfth of the initial weight of the cow, while calves from mature cows averaged about one-sixteenth of the initial weight. First-gestation calves aver-

aged in weight about one-fourth of the total gain in weight during pregnancy, while calves from mature cows averaged about two-fifths of the pregnancy gain.

The weight of the placenta and amniotic fluid showed no breed relationship, but was slightly higher for the first gestation than for later ones. There was considerable variation in the relationship of the weights of tissues and fluid to the gain in weight during pregnancy. The gain in actual body weight during pregnancy was about one-fifth of the initial weight of the cow during the first pregnancy, while for mature cows this gain averaged from 3.8 to 8 percent of the initial weight. During the first gestation period this body weight increase was almost two-thirds of the gain in weight during pregnancy, but during succeeding gestations decreased until for mature cows the range was from 28 5 to 49.7 percent. Cows appeared to reach a stabilized weight about 45 days after calving.

Rations using maximum amounts of pineapple bran and cane molasses for dairy cows, L. A. HENKE and G. W. H. GOO (*Hawaii Sta., Anim. Husb. Div. Prog. Notes No. 13 (1936), pp. 6*).—In each of three experiments a ration consisting largely of pineapple bran and cane molasses with soybean oil cake meal as the protein supplement was compared with a ration consisting of imported feeds. The double reversal system of feeding was followed. Six cows were used in each of the experiments.

Milk production was 2 percent lower and feed cost was 32 percent lower when the pineapple bran ration was fed as compared with the imported ration. There was no significant reduction in live weight of the cows or the fat content of milk when the locally produced ration was fed. There were indications that because of the similarity in protein and total nutrient content of pineapple bran and cane molasses a greater proportion of the latter feed might be profitably used under certain conditions.

Differences in the lactic acid percentages in butters, E. O. WHITTIER and C. S. TRIMBLE (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 6, pp. 389, 390*).—Using the method of Friedemann, Cotonio, and Shaffer (E. S. R., 58, p. 114), the authors of this contribution from the U. S. D. A. Bureau of Dairy Industry found that "butter made without the use of starters from normal cream containing less than 0.25 percent of titratable acid will contain less than 0.025 percent of apparent lactic acid. Butter made without the use of neutralizing agents from normal sour cream containing more than 0.40 percent of titratable acid will contain more than 0.100 percent of apparent lactic acid. Butter made from sour cream neutralized to approximately 0.20 percent titratable acidity will contain more than 0.050 percent of apparent lactic acid. Dilution of the cream with water or sweet skim milk, or washing of the butter with alkaline water, will somewhat decrease the percentage of apparent lactic acid in the butter. Such procedures are, however, not likely to be encountered commercially, since they injure the flavor and texture of the butter. Storage of butter even at temperatures considerably higher than those customarily used for butter storage has no effect on the percentage of apparent lactic acid present."

VETERINARY MEDICINE

Comparative pathology of the tumors of domestic mammals [trans. title], R. COURTEAU (*Paris: Lefrançois, 1935, pp. 264, figs. 77*).—In the first part of this critical review chapters are devoted to the neoplasms of horses, sheep, cattle, goats, swine, dogs, cats, rabbits, and guinea pigs, respectively (pp.

10–178), a list of references to the literature accompanying each. In the second part they are taken up by histological types and the organs in which they appear (pp. 179–247).

[Report on animal disease investigations by the Ohio Station] (*Ohio Sta. Bul. 561 (1936), pp. 88–90*).—In the studies here briefly referred to reference is made to work during the year with Bang's disease in cattle, by B. H. Edgington; pseudorabies (mad itch) in cattle, by Edgington and N. A. Frank; and fowl paralysis and the relationship of incubation environment, by Edgington.

[Report of the Health of Animals Branch] (*Canada Min. Agr. Rpt., 1934–35, pp. 37–43*).—Brief reports of the work of the Contagious Diseases Division and the Pathological Division of the Canadian Department of Agriculture are presented.

Diseases of animals: Prevention and treatment, F. C. MINETT (*Jour. Roy. Agr. Soc. England, 96 (1935), pp. 200–228*).—This contribution deals with the method of infection and spread of bovine mastitis (pp. 200–204); immunization of cattle against tuberculosis by the B. C. G. method (pp. 205–211) and the "diallyte" vaccine of Dreyer et al. (E. S. R., 71, p. 535) (pp. 211–213); the prevalence of tubercle bacilli and *Brucella abortus* in milk (pp. 213–215); "louping ill" and tick-borne fever of sheep (pp. 215–218); and diseases associated with disturbed mineral metabolism, by H. H. Green (pp. 218–227), including skeletal disorders, hypomineralemias (milk fever, lactation tetany, and transit tetany), and nutritional anemias. A list of 44 references to the literature is included.

[Contributions on animal diseases] (*Acta Path. et Microbiol. Scand., Sup. 18 (1934), pp. 28–41, 64–204, 225–237, pls. 22, figs. 3*).—The contributions here presented include the following: Does Gaertner "Endotoxin" Administered Parenterally to White Rats and Mice Engender Immunity to a Subsequent Peroral Infection With Living Gaertner Bacilli? by L. Bahr (pp. 28–41); Histological Investigations of *Brucella suis* Infection of Swine [trans. title], by M. J. Christiansen and A. Thomsen (pp. 64–85); Contribution to Infectious Rhinitis (Schnüffelkrankheit) of Swine [trans. title], by A. Eber and A. Meyn (pp. 86–103); The Hydatidiform Mole in Cattle [trans. title], by A. F. Følger (pp. 104–125); Tubercle Bacilli in Fowl as Cause of Progressive Tuberculosis in Cattle; Transformation of the Bacilli in the Direction of the Bovine Form, by H. Holth (pp. 126–142); On the Relative Frequency of Various Diseases Among Calves in Denmark, by E. Mejlbo (pp. 143–164); A Comparison of Icelandic Bradapest With German Bradsot of Sheep [trans. title], by H. Miessner and G. Schoop (pp. 165–180); Uterine Tuberculosis in Cow, by F. Nielsen and N. Plum (pp. 181–204); and On the Histological Alterations in the Liver and Kidneys in Pernicious Anemia in Horse (Infectious Anemia in Horse), by S. Wall (pp. 225–237).

Live stock diseases report, No. 11, M. HENRY (*N. S. Wales Dept. Agr., Livestock Diseases Rpt., 11 (1934–35), pp. 25*).—This is a report on the occurrence of and control work with diseases of livestock during the year ended June 30, 1935.

The occurrence, biology, and importance of Bang's disease in Finland [trans. title], V. M. KLEMOLA and S. KNUTTILA (*Maataloustiet. Aikakausk. [Helsinki], 8 (1936), No. 1, pp. 36–59, figs. 12; Finn. abs., pp. 58, 59*).—This discussion of Bang's disease as it occurs in Finland is presented with a list of 27 references to the literature.

Mammals concerned in the bubonic plague and rabies problems in South Africa, A. ROBERTS (*So. African Jour. Sci., 32 (1935), pp. 414–460*).—This contribution consists of notes on the mammals and keys to the families of South

African rodents and to the species of squirrels, rats, and mice; a list of the rodents arranged by families; and notes and a key to the families and a list of South African Carnivora.

Transmission of rabbit papillomatosis by the rabbit tick (Haemaphysalis leporis palustris), C. L. LARSON, J. E. SHILLINGER, and R. G. GREEN (*Soc. Expt. Biol. and Med. Proc., 33 (1936), No. 4, pp. 536–538*).—The authors' successful transmission of the filtrable virus causing papillomatosis among rabbits through the feeding of the rabbit tick, while showing only a mechanical transfer, has demonstrated that sufficient virus may be carried by ticks to produce successful inoculation. It is thought probable that this infection may be similarly transferred by mosquitoes and bloodsucking flies.

Effectiveness of the Shope papilloma virus in various American rabbits, J. W. BEARD and P. ROUS (*Soc. Expt. Biol. and Med. Proc., 33 (1935), No. 1, pp. 191–193*).—It is pointed out that the virus causing cutaneous horns and papillomas in western cottontail rabbits (*Sylvilagus floridanus* Allen) has been shown by Shope (E. S. R., 70, p. 683) to give rise to vigorous growths of the same sort in domestic rabbits (*Oryctolagus cuniculus*). In both of these animals these growths have the immediate character of neoplasms, and in domestic rabbits they frequently progress to cancer. Thus far rabbits only have proved susceptible to the virus.

The inoculation of domestic, cottontail, and snowshoe (*Lepus americanus*) rabbits with a "natural" jack rabbit (*L. californicus*) papilloma extract has led the authors to conclude that jack rabbit papilloma is due to the same virus that causes this affection in cottontails. Inoculation of the cottontail virus led to the development of the growth in snowshoe, jack, and domestic rabbits. As a rule, the papillomas appeared later and grew more slowly in snowshoe and jack rabbits than in domestic rabbits receiving the same inoculum; they regularly yielded active virus.

Studies on the etiology of rabbit pox.—V, Studies on species susceptibility to rabbit pox virus, L. PEARCE, P. D. ROSAHN, and C. K. HU (*Jour. Expt. Med., 63 (1936), No. 4, pp. 491–507, pl. 1, fig. 1*).—In continuation of their studies (E. S. R., 74, p. 849), the authors have found the white mouse, guinea pig, calf, and probably the rat to be susceptible to infection with the virus of rabbit pox. Serial transmission of the virus in mice by brain to brain passage was characterized by a fatal outcome, usually on the fifth or sixth day after inoculation.

"Infection of the guinea pig was accomplished by intratesticular injection, and the virus was continued to the second passage in this species. Guinea pigs developed a well-marked cutaneous reaction from the intradermal injection of both rabbit and guinea pig tissue virus. Active virus was demonstrated in the testicles of rats 8 days after intratesticular injection by rabbit subinoculation. In the calf, inoculation of the scarified skin was followed by the development of large papular lesions with marked hemorrhage and necrosis. The results of the investigations on the etiology of rabbit pox and of the experimentally induced infection reported in this and the four preceding papers are discussed with special reference to the relation of pox virus to other viruses and of rabbit pox to other pock diseases."

Laboratory diagnosis in trichinosis, L. S. HEATHMAN (*Amer. Jour. Hyg., 23 (1936), No. 2, pp. 397–409, figs. 2*).—In laboratory diagnosis in Minnesota, the author found the intradermal skin test and the precipitin test to be of much less value in the detection of trichinosis than are the eosinophile count, together with muscle biospy, and the study of the meat suspected to be the source of infection.

"Intradermal skin tests and precipitin tests in animals heavily infested with *Trichinella* larvae gave even a lower percentage of positive reactions than that found in human beings. Animals did not tend to develop positive intradermal reactions regularly after being tested a number of times. The intradermal tests in both man and animals are less clear-cut and more difficult to read than a number of other diagnostic intradermal tests."

The account is accompanied by a list of 23 references to the literature.

Further studies on the transmission of Trypanosoma hippicum Darling by the vampire bat (Desmodus rotundus murinus Wagner), C. M. JOHNSON (*Amer. Jour. Trop. Med., 16 (1936), No. 2, pp. 163–172*).—Further work (E. S. R., 74, p. 849) has led to the conclusion that *D. rotundus murinus*, a study of which by Ditmars and Greenhall has been noted (E. S. R., 73, p. 338), serves merely as a mechanical vector and not a biological vector of *T. hippicum*. "The trypanosomes reach the saliva of the bat through breaks in the oral mucosa, and possibly by migration through the intact mucosa. The saliva is deleterious to the trypanosomes. The infection in the bat is not always fatal. Six recovered and have not yet relapsed. Tissue studies failed to show the trypanosomes in the lumen of the ducts of the salivary glands or in any other structures closely associated with the oral cavity."

Progress in the eradication of tuberculosis during the year 1935, H. R. SMITH (*Natl. Livestock Exch., Sanit. Com. Ann. Rpt. Erad. Tuberc. Livestock, 1935, pp. [2]+14, pl. 1*).—This report of the progress that has been made in the eradication of bovine tuberculosis during the year 1935 is accompanied by tabulated summaries. An account of the progress with avian tuberculosis is included.

A strain of endemic typhus fever isolated from the brain of a wild rat, G. D. BRIGHAM (*Pub. Health Rpts. [U. S.], 51 (1936), No. 13, pp. 337–339*).—In the course of control work with endemic typhus fever in Alabama, a strain of the virus was isolated from the brain of a wild rat (*Rattus norvegicus*) trapped at a typhus focus in Montgomery.

Effect of vitamins B and G deficient ration on a coccidian infection, E. R. BECKER and N. F. MOREHOUSE (*Soc. Expt. Biol. and Med. Proc., 33 (1935), No. 1, p. 114*).—A comparison was made of 15 half-grown rats fed a diet deficient in vitamins B and G with 15 fed a similar diet but to which 8 percent of powdered yeast was added. After 9 days on these rations each rat was infected by mouth with 1,500 sporulated oocysts of *Eimeria miyairi* daily for 5 successive days.

It was found that rats on the vitamin B- and G-deficient diet developed infections only from a fourth to a fifth as heavy as the control rats. Both series were refractory to subsequent reinfection when restored to the growing diet. It is concluded that the yeast contains something that favors the development of a coccidian infection.

The pamakani (Eupatorium glandulosum) (*Hawaii Sta. Rpt. 1935, pp. 24, 25*).—Analyses of this weed, known to be poisonous to cattle, are briefly reported.

The passage of fluids through the ruminant stomach.—III, The effects of volume of fluid and the site of stimulation on the reflex closure of the oesophageal groove, with a note on the influence of size of dose on anthelmintic efficiency, I. CLUNIES ROSS (*Austral. Vet. Jour., 12 (1936), No. 1, pp. 4–8*).—A continuation of the work previously noted (E. S. R., 71, p. 533).

The importance of bacterin treatment in combating infectious abortion in cattle, S. WALL (*Acta Path. et Microbiol. Scand., Sup. 16 (1933), pp. 543–548*).—Further work (E. S. R., 68, p. 529) has led to the conclusion that

the bacterin or killed virus treatment confers a good immunity against infectious abortion in a herd of cattle and acts favorably on the course of the disease, so that during the year following the treatment of the herd the abortion percentage falls very markedly. Pregnant animals which are infected and are treated with bacterin afterward are influenced injuriously by the treatment, so that the abortion percentage increases in the case of such cows. This is only during the year of treatment, however.

Further observations on glycerine-boric acid dressings for fly-struck sheep, M. R. FRENEY and I. M. and M. J. MACKERRAS (*Jour. Council Sci. and Indus. Res. [Austral.], 9 (1936), No. 1, pp. 11–18*).—Reporting further upon observations of the glycerin and boric acid dressings for fly-struck sheep (E. S. R., 74, p. 855), additional evidence obtained supports the view that the diboric preparation has valuable properties as a dressing, both by reason of its immediate effects on the maggots, on the well-being of the sheep, and on the strike wounds and of its later effects in preventing restrike. The preparation is decidedly improved by the addition of not more than 25 percent by volume of ethyl alcohol, which may be denatured with methanol. Soap crude glycerin is not a satisfactory substitute for pure glycerin in the preparation of the dressings. The preparations may prove useful as preventives, more particularly on the heads of rams.

A new Rickettsia of sheep [trans. title], F. LESTOQUARD and A. DONATIEN (*Bul. Soc. Path. Exot., 29 (1936), No. 2, pp. 105–108*).—Under the name *R. ovina* the authors describe a new form, characterized by its frequence in the monocytes of the peripheral circulation, in sheep of the Mediterranean Basin in Algeria. It is differentiated from *R. ruminantium* in that the mortality resulting is very low. *Rhipicephalus bursa* appears to be the agent of transmission.

Tumors of the sheep—the role of parasites and infections in the genesis of pulmonary cancer, A. MANDON (*Les tumeurs chez le mouton, rôle des parasites et des agents infectieux dans la genèse des cancers du poumon. Paris: Libr. E. le François, 1935, pp. [2]+95, figs. 17*).—This is a report of a critical study presented in seven chapters and with a five-page list of references to the literature.

[Control of parasites in lambs] (*Assoc. South. Agr. Workers Proc., 34 (1933), pp. 110, 111, 112, 113*).—Contributions on the control of parasites in lambs, presented at the annual convention of the Association of Southern Agricultural Workers held in New Orleans, La., in February 1933, include The Effectiveness of Sanitary Methods in the Control of Stomach Worms in Lambs, by J. E. Foster (pp. 110, 111), contributed from the North Carolina Experiment Station, and The Effect of Drench Upon the Gains and Parasites of Lambs, by M. G. Snell (pp. 112, 113), contributed from the Louisiana Experiment Station.

Parasites in slaughter houses in Canton.—I, Helminths of Kwangtung hogs, H. T. CHEN (*Lingnan Sci. Jour., 15 (1936), No. 1, pp. 31–44, figs. 18; Chin. abs., p. 44*).—In the course of careful examinations of the alimentary tracts of 100 hogs from various slaughterhouses in Canton from 1931 to 1934 and of samples of the diaphragms of more than 1,000 hogs for possible trichinosis, 13 species of nematodes, 3 of trematodes, 1 of cestodes, and 1 of Acanthochephala were found, namely: Trematodes—*Clonorchis sinensis, Fasciolopsis buski,* and *Fasciola hepatica;* cestode—*Cysticercus tenuicollis;* nematodes—*Ascaris lumbricoides, Globocephalus connorfilii, G. samoensis, Oesophagostomum longicaudum, O. dentatum, Bourgelatia diducta, Ancylostoma caninum, Physocephalus* sp., *Arduenna strongylina, Arduenna* sp., *Gnathostoma hispidum, Trichuris suis,*

and *Strongyloides papillosus;* and Acanthocephala—*Macracanthorhynchus hirudinaceus.*

A new parasite, a new disease: Intestinal distomatosis of swine [trans. title], MAROTEL (*Rev. Vét. [Toulouse], 88 (1936), Mar., pp. 130–133, fig. 1*).—A disease which in swine herds in the region of Mateur, Tunisia, has resulted in 30 percent of the animals dying has been found to be caused by a new fluke, here described as *Harmostomum suis.*

A Brachylaemus from the intestine of swine [trans. title], L. BALOZET (*Bul. Acad. Vét. France, 9 (1936), No. 1, pp. 93–99, figs. 6*).—Under the name *B. suis* the author describes a new fluke which has caused a large loss of 2- to 4-month-old pigs in the region of Bizerte, Tunisia.

Spontaneous salmonellosis of swine, T. TOPACIO (*Philippine Jour. Anim. Indus., 2 (1935), No. 6, pp. 393, 394*).—A report is given on two cases of spontaneous salmonellosis due to *Salmonella suipestifer,* the first to be officially reported in the Philippines.

Tissue cultures as a more sensitive method than animal inoculation for detecting equine encephalomyelitis virus, H. R. COX (*Soc. Expt. Biol. and Med. Proc., 33 (1936), No. 4, pp. 607–609*).—The experiments reported have shown that "cultures of minced chick embryo tissue suspended in Tyrode's solution can reveal the presence of equine encephalomyelitis virus (eastern strain) in dilutions which are inactive after intracerebral inoculation of mice and guinea pigs; the virus multiplies rapidly in cultures within 72 hr. and, with more medium, a single inoculum larger than that employed in the animals can be tested for virus content.

"The culture method has been applied in attempts to detect small amounts of active encephalomyelitis virus in formolized vaccines which were inactive by animal inoculation. Moreover, multiplication of minute quantities of virus in tissue cultures was not inhibited by the presence in them of formolized vaccines in which the formalin was neutralized by ammonia. It was thus possible to determine that an amount of vaccine (1 cc), the immunizing dose, contained no detectable active virus."

Some symptoms of experimental equine encephalomyelitis (Argentine virus) [trans. title], P. REMLINGER and J. BAILLY (*Bul. Acad. Vét. France, 8 (1935), No. 8, pp. 420–428, figs. 6*).—The symptoms of the disease are reported upon and it is differentiated from Borna disease.

[Contributions on poultry diseases] (*Northeast. Poultry Prod. Council, Ann. Fall Conf. Proc., 5 (1935), pp. 52–55*).—Brief discussions contributed at the annual conference at College Park, Md., August 1935, are as follows: Coccidiosis, by E. P. Johnson (p. 52); Bronchitis, by F. R. Beaudette, from the New Jersey Experiment Stations (pp. 53, 54); and Range Paralysis, by E. L. Jungherr (p. 55).

[Contributions on diseases and parasites of poultry] (*Assoc. South. Agr. Workers Proc., 36 (1935), pp. 592, 593–595, 596, 597*).—Contributions presented at the annual convention of the Association of Southern Agricultural Workers held at Atlanta, Ga., in January and February 1935 relating to diseases and parasites of poultry include the following: Three Years' Results in Preventing Chicken Pox, Roup, and Canker in South Carolina With a Home-Made Virus, by P. H. Gooding (p. 592); Pullorum Disease Control in Mississippi, by J. D. Sykes (pp. 593, 594); Controlling Mortality in Laying Flocks, by E. F. Stanton (p. 594); The Influence of Treatments for Internal Parasites Upon Egg Production and the Relative Efficiency of Treatment, by W. L. Bleecker and R. M. Smith (p. 595), contributed from the Arkansas Experiment Station; and

Breeding as a Factor in the Control of Blindness and Paralysis, by C. W. Upp (pp. 596, 597).

A fowl cholera vaccine, T. TOPACIO (*Philippine Jour. Anim. Indus., 2 (1935), No. 6, pp. 369–373*).—In the three preliminary experiments reported in this contribution it was shown that when the culture of *Pasteurella avicida* was treated with a suitable strength of sodium hydrate either the supernatant or the sediment gave rise to a product capable of protecting chickens against lethal doses of the virulent culture. The vaccine from different concentrations of the organism, when treated with sodium hydrate, was also shown to be antigenic.

Studies on an uncomplicated coryza of the domestic fowl, V, VI, J. B. NELSON (*Jour. Expt. Med., 63 (1936), No. 4, pp. 509–522, pl. 1*).—The continuation of these studies (E. S. R., 73, p. 108) is presented in two parts.

V. *A coryza of slow onset* (pp. 509–513).—In this work a strain of fowl coryza of slow onset was carried through 20 successive passages in susceptible birds over a period of approximately 19 mo. During this period it retained its initial characteristics, as did also a coryza of rapid onset which was similarly maintained. Eighty-eight percent of 72 birds infected with the coryza of slow onset showed a nasal discharge after an incubation period of 12 days or more, the actual limits being 9 to 31 days. Ninety-eight percent of 54 birds infected with the coryza of rapid onset showed a nasal discharge on the first or second day after injection. The duration of both coryzas was prolonged. Bacteriological examination indicated that *Hemophilus gallinarum*, which is invariably present in the nasal exudate of birds infected with the coryza of rapid onset, is not associated with the coryza of slow onset.

VI. *Coccobacilliform bodies in birds infected with the coryza of slow onset* (pp. 515–522).—Minute coccobacilliform bodies were regularly found by the author in the nasal exudate of fowls infected both by injection and by contact with the coryza of slow onset. These bodies are commonly less than 0.5μ in diameter and are predominantly extracellular. They have consistently failed to grow in artificial media. They are held back by Berkefeld V filters which are impermeable to *H. gallinarum*, but may pass through filters which are permeable to the test organism. The coccoid bodies are morphologically similar to a cultivable noninfective bacterium which may occasionally be isolated from exudate of the infected fowls.

Infectivity experiments with the virus of laryngotracheitis of fowls, H. R. SEDDON and L. HART (*Austral. Vet. Jour., 12 (1936), No. 1, pp. 13–16, fig. 1*).—The experiments reported have shown that the virus of laryngotracheitis causes an inflammatory lesion when applied to any part of the respiratory mucous membrane, but that in order to be certain of its reaching the trachea and setting up the tracheitis so typical of this disease the route to be preferred is intratracheal injection.

It was found that "serum of recovered birds may neutralize the virus in infective tracheal exudate when mixed with it and incubated an hour. Serum injected subcutaneously at the same time as virus injected intratracheally afforded no protection. In a further test where American convalescent serum and another strain F serum were cross-tested with strain F and American virus, respectively, no protection was afforded."

The intratracheal injection of the virus into turkeys, ducks, starlings, quail, pigeons, and sparrows failed to infect in all cases.

Investigations of the so-called Marek's fowl paralysis (polyneuritis gallinarum), R. ROMMEL (*Untersuchungen über das Wesen der sogenannten Marekschen Geflügellähme (Polyneuritis gallinarum). Inaug. Diss., Tierärztl. Hochsch., Berlin, 1932, pp. 64*).—This is a report of studies of an affection first reported by Marek in 1907 (E. S. R., 19, p. 688), conducted by the author in

1929 and 1930 with 37 fowls on 18 different farms. It is presented with a 9-page list of references to the literature.

Summary of studies on fowl pox, R. GRAHAM and E. H. BARGER (*Vet. Med., 31 (1936), No. 2, pp. 78–81*).—The results obtained in fowl pox immunization in conjunction with sanitary measures conducted at the Illinois Experiment Station since 1926 are briefly summarized under the headings of immunizing properties of fowl pox vaccine; saponinized fowl pox virus; formolized fowl pox and pigeon pox (applied follicle and applied stick methods) vaccines as immunizing agents, and the immunizing value of antidiphtherin and the nonimmunizing property of human vaccine virus against fowl pox in chickens; the nonimmunizing property of fowl pox vaccine against pigeon pox in pigeons; and vaccination of day-old chicks with fowl pox vaccine. The work was conducted with approximately 30,000 fowls in the field, including 2 large flocks of turkeys, supplemented by laboratory studies on more than 5,000 pullets and cockerels.

Septicaemic pullorum disease in a flock of adult fowls, L. HART and T. G. HUNGERFORD (*Austral. Vet. Jour., 12 (1936), No. 1, pp. 17–20*).—An account is given of a disease met with in a flock of 600 adult fowls in which approximately 8 percent died and about 25 percent showed symptoms. It was manifested as a septicemia, with some focal infection in heart muscle, liver, spleen, and kidney. Cultures from these tissues yielded an organism which was differentiated from *Salmonella sanguinarium* and shown to be *S. pullorum*.

Reference is made to the report by Bennetts (E. S. R., 74, p. 856) of the loss of adult fowls caused by *S. pullorum* in Western Australia, the symptoms and lesions of which as described are almost identical with those observed by the authors in New South Wales.

The life history of a poultry cestode, M. F. JONES and M. W. HORSFALL (*Science, 83 (1936), No. 2152, pp. 303, 304*).—The authors have demonstrated that the ant *Tetramorium caespitum* L. is an intermediate host for *Raillietina echinobothrida* (Mégn.) Railliet, a tapeworm of common occurrence in poultry.

The northern fowl mite and its control, W. A. MAW, W. E. WHITEHEAD, and L. H. BEMONT (*Sci. Agr., 16 (1935), No. 2, pp. 79–84, pl. 1, fig. 1*).—This further contribution (E. S. R., 72, p. 820) deals with the manner in which the northern fowl mite *Liponyssus silviarum* C. & F. is disseminated, including a list of 14 species of wild birds found to be carriers, its life history and habits, economic significance, and means of control. It is concluded that economically this mite is more serious than the ordinary red mite since it remains on the body of the fowl continually, thereby being readily carried from one farm to another, and thus is more difficult to control. The results of laboratory tests with a number of direct contact sprays and their application to the litter have shown that the infestations may be kept in check with considerable ease.

Coccidiosis of the grey and stone partridge, W. L. YAKIMOFF and I. L. MATIKASCHWILI (*Parasitology, 28 (1936), No. 1, pp. 146, 147*).—A coccidian which appears to be common to both the gray partridge (*Perdix perdix*) and the stone partridge (*Caccabis chucar*) in Leningrad, U. S. S. R., is considered to represent a new species, to which the name *Eimeria kofoidi* is given.

AGRICULTURAL ENGINEERING

Soil and rainfall conservation in New Mexico, C. P. WILSON, P. E. NEALE, K. W. PARKER, and H. N. WATENPAUGH (*New Mexico Sta. Bul. 238 (1936), pp. 45, figs. 28*).—A large amount of practical information is presented, with particular reference to New Mexico conditions.

Part 1, relating to range lands, contains sections on effects of overgrazing on plant cover, plants for erosion control, and effect of plant cover on soil erosion. Part 2, relating to farm lands, contains sections on soil properties affecting erosion and suggested methods for soil and rainfall conservation, with particular reference to the prevention of water and wind erosion and flood water utilization and control.

The experimental data accumulated indicate that the problem of soil and rainfall conservation in New Mexico is, in some respects, more difficult of solution than in a majority of the other States. It is evident that, as elsewhere, reseeding by the use of native or introduced plants will be one of the most practical means of reducing erosion. However, largely on account of the scant and erratic precipitation and the depredations of rabbits and other rodents, the results of range reseeding operations are often very uncertain. The fact that much of the soil is rocky and that a large percentage of the land which is eroding badly is occupied to some extent by plants of little economic value will make reseeding with more valuable species more difficult and expensive than it otherwise would be. As a rule, native species have been found to be better adapted for reseeding in the State than introduced plants.

Although torrential rains seldom occur in any one locality in this part of the country, they will make heavy demands on soil and moisture conservation structures. If it seems probable that land at present in pasture in the dry-farming areas of the State will blow to a considerable extent if plowed and devoted to crop production, such land should remain in pasture.

Soil crusts, A. CARNES (*Assoc. South. Agr. Workers Proc., 35 (1934), pp. 214, 215*).—In a contribution from the Alabama Experiment Station methods are described which were used in studying the mechanical properties of soil crusts in connection with efforts to overcome their injury to cotton stand.

It was found possible to reproduce crusts very similar to those found in field soils by sprinkling soil in the laboratory with large drops of water. The crusts appeared to be produced by the infiltration of colloids and later cementation of soil particles. The modulus of rupture was used as a measure of crust formation.

The amount of crust formed on a given soil varies with the amount of rain. It appears for the soils with the least hydrated colloids, such as Cecil, Sumpter, and Houston, that the relationship between rainfall and the force of breaking for each soil follows a general law whose form is $R=ae^{bx}$ when R is the modulus of rupture, a the intercept constant, b the slope constant, and x the amount of rain in inches. R is proportional to the surface in contact which is a function of pore space. The formula states that the rate at which the pore space fills up, under the action of water, is proportional to the pore spaces.

The rate of drying affects the breaking strength of crust. A slow rate of drying produces a crust slightly harder to break. The breaking strength of crust, formed under a given condition, was found to bear an inverse relationship, within the range studied, to the amount of moisture in the crust at the time of breaking. The chemical nature of the soil affects the breaking strength of crust. The modulus of rupture of the crust of soils studied is greater in cotton middles than on ridges.

Preliminary tests indicate that the injury to cotton stands caused by crust formation can be solved by the proper preparation of the seedbed before and at the time of planting. Planting cotton on a compacted seedbed affords a firm footing for the young plant in breaking through the crust and results in a more efficient use of moisture present in the soil.

Soil conservation in an improved agriculture, M. F. MILLER (*Missouri Sta. Bul. 362 (1936), pp. 15, figs. 7*).—This is a brief popular discussion.

Erosion control on mountain roads, C. J. KRAEBEL (*U. S. Dept. Agr. Circ. 380 (1936), pp. 45, pls. 15, figs. 6*).—The purpose of this circular is to indicate erosion-preventive measures which can be incorporated in the planning and building of mountain roads and to describe corrective measures which are applicable particularly to California conditions.

Appendixes are included on examples of road erosion in California—damage caused and quantities of soil moved; estimated specifications for labor, equipment, and materials; outline of procedure in contour wattling; forms for reconnaissance and cost records; planting districts and plant lists; and notes on handling and sowing seed.

A formula for capacities of reservoirs, G. C. DOBSON (*Soil Conserv. [U. S.], 1 (1936), No. 7, pp. 7–9, figs. 3*).—A formula is described which was developed specifically for computing original and present capacities and silt volumes in storage reservoirs.

Selection of lumber for farm and home building, C. V. SWEET and R. P. A. JOHNSON (*U S. Dept. Agr., Farmers' Bul. 1756 (1936), pp. II+46, figs. 16*).—Practical information is given on the selection of lumber to meet the essential requirements of different buildings and other uses and on how different kinds of woods meet these requirements. Some principles of good construction also are presented.

Treatment of native woods for posts (*Connecticut [New Haven] Sta. Bul. 381 (1936), p. 184*).—Experiments on the open tank creosoting of native posts are briefly reported.

Alcohol and alcohol-gasoline blends as fuels for automotive engines, IV, V (*Philippine Agr., 24 (1936), Nos. 9, pp. 763–775, figs. 2; 10, pp. 839–853, figs. 8*) —These papers continue the series (E. S. R., 74, p. 552).

IV. *Performance characteristics of alcohol, alcohol-gasoline mixtures, and gasoline as motor fuels under different road conditions,* A. L. Teodoro, A. B. Catambay, E. K. Ongsansoy, and J. P. Mamisao.—Studies are reported of fuel and oil consumption and performance of a truck and automobile under different road conditions using alcohol, gasoline-alcohol mixtures, and gasoline as fuels. Two kinds of alcohol were used, namely, (1) denatured dehydrated alcohol having a purity of 193° proof, and (2) Alkohl motor fuel No. 8 containing 100 parts by volume of 190° proof ethyl alcohol plus 3 parts by volume of gasoline. V-8 engines were used in both cases.

With gasoline as 100 percent, the minimum efficiency obtained with the use of Alkohl motor fuel No. 8 was 57.5 percent and the maximum 83.6 percent. A fair weighted average was about 73 percent.

An alcohol-gasoline mixture containing 5 percent by volume of denatured dehydrated 193° proof ethyl alcohol gave practically the same mileage as gasoline. Since detonation was minimized with the addition of alcohol, the efficiency of the mixture on hilly roads, where gasoline showed evidence of knocking, was higher by about 2 percent than gasoline. The use of mixtures containing from 10 to 20 percent by volume of denatured dehydrated 193° proof ethyl alcohol exceeded the efficiency of gasoline by an amount varying from 0.7 to 16.8 percent. Some tests showed that the efficiency of the mixture increased as the percentage of alcohol in the mixture was increased to 15 percent. The performance of the engine using a mixture containing 20 percent by volume of denatured dehydrated 193° proof alcohol was characterized by slower acceleration on low speeds and by rather poor idling.

It was indicated that the oil consumption expressed in cubic centimeters per 100-ton-km was about 10 percent higher in the use of Alkohl motor fuel No. 8 than in gasoline. Starting from cold, using Alkohl motor fuel No. 8, was not so fast as with the use of gasoline. Without any change in the engine adjust-

ment, road performance with the use of mixtures containing as high as 15 percent denatured dehydrated 193° proof ethyl alcohol was practically the same as gasoline.

V. *Studies on the performance of an eight-cylinder engine using gasoline, dehydrated alcohol, and dehydrated alcohol-gasoline mixtures*, A. L. Teodoro.—In these studies the important points considered were ease of starting, fuel consumption, maximum power developed, and general behavior of the engine at full and at fractional loads when tested on the block.

Dehydrated alcohol of strength 98.5 percent by volume, denatured with about 5 percent sulfuric ether, proved to be an efficient and an excellent fuel for an 8-cylinder automobile engine having a compression ratio of 6.33:1. Mixtures of this alcohol and of gasoline in different proportions by volume were found miscible under the conditions in which they were tested. No sign of separation of the fuels was noted when the temperature of the liquid was lowered to 15° C. Mixing dehydrated alcohol with gasoline minimized, if it did not entirely suppress, the tendency of gasoline to detonate. Engine operation at full throttle on gasoline showed evidence of detonation at all speeds. With the mixture containing 10 percent dehydrated alcohol, detonation at this load was heard at the lowest running speed only. No difficulty in starting from cold was experienced with any of the fuels used. When the engine was not yet warmed up, in order to maintain a steady running operation with the use of mixtures containing more than 40 percent dehydrated alcohol, it was found to be necessary to close the choke partially for a few seconds.

Relatively greater power could be developed with the use of dehydrated alcohol and with mixtures containing at least 60 percent dehydrated alcohol than with the use of gasoline. At speeds below 400 r. p. m., operation on mixtures containing at least 30 percent dehydrated alcohol was characterized by jerky movements and by decreasing load after 3 min. of running.

Fuel mixture containing 10 percent dehydrated alcohol gave as much fuel economy, if not more, as gasoline at all loads except at one-half, where an increase in consumption was noted as the percentage of dehydrated alcohol in the mixture was increased. Using the mixture containing 10 percent dehydrated alcohol as a basis, the percentage increase in fuel consumption per every 10-percent increase of dehydrated alcohol in the mixture was about 4 to 5 percent at full load, 5 to 6 percent at three-fourths load, about 6 percent at one-half load, and from 5 to 7 percent at one-fourth load.

The effect of tractor tire size on drawbar pull and travel reduction, M. J. Samuelson, L. W. Hurlbut, and C. W. Smith (*Agr. Engin., 17 (1936), No. 4, pp. 143–149, figs. 35*).—Studies conducted at the Nebraska Experiment Station are reported. The tire inflation pressures used were 8, 15, and 16 lb. Five tire sizes were used.

The results showed that by changing the inflation pressure from 16 to 8 lb. on the tractor-testing course a loss of 8.7 percent in traction was experienced in July and 7.2 percent in August, while on one plowed field a gain of 14.8 percent in traction was made and on another plowed field a gain of 25.5 percent in traction was secured. The tractor-testing course was dusty on top with a hard base. Drawbar pull was nearly independent of wheel diameter for the conditions of these tests. Tire cross section alone had relatively little to do with drawbar pull. A change in tire cross section did not affect traction.

Hitches for field machinery, D. E. Wiant and L. W. Minium (*South Dakota Sta. Bul. 297 (1935), pp. 55, figs. 33*).—This bulletin describes, illustrates, and gives technical specifications for hitches to pull two or three implements in the field, including information for building hitches to pull any combinations of widths of two or three grain drills, field cultivators, disks, or other similar

implements. The information consists of tables of specifications, drawings of designs, and actual photographs of hitches in the field, together with detailed instruction on how to build various hitches. The hitches described were developed from experimental hitches and are the results of 2 years' trials and tests in the field and laboratory.

Results of studies of the cutting edges of tillage implements, F. J. ZINK, G. A. SELLERS, and J. ROBERTS (*Agr. Engin., 17 (1936), No. 3, pp. 93–97, 118, figs. 7*).—This is a progress report of studies at the Kansas Experiment Station on those parts of tillage implements which function in the soil. The work reported relates to the maintenance of plowshare cutting edges. No conclusions are reported, although a considerable amount of progress data are included.

A special wear-testing machine developed by the station is described. In this machine the soil in a trough-shaped pan is rotated against the specimens at approximately plowing speeds. Speed changes are made by changing pulleys on the motor and countershaft. The specimens are given an oscillating motion by a cam and push rods. The cam is driven by a ratchet and pawl mounted on the final drive shaft. By this means the specimens not only move back and forth in a simple harmonic motion across and at right angles to the rotating pan, but also they remain stationary a part of the time. This oscillating motion is to prevent the specimens from traveling in the same path, a condition which would result in not using all the soil in the pan.

The specimen holders are mounted on arms pivoted above the machine. The holder and the arm are telescoping pipes locked together by means of a bolt.

The specimens are mounted on the holder at an angle of 30° with the horizontal by means of a plow bolt. This angle was obtained by trial of a number of plowshares on which measurements were taken one-fourth the distance from the plowpoint. The specimens are 2 in. wide by 4 in. long by ¼ or $\frac{5}{16}$ in. in thickness. The ¼-in. specimen has been used in the majority of the tests. The specimens are held with the edges parallel to the radii of the circular soil pan. The cutting edges of the specimens are ground at a 30° angle formed by the top surface and the finished ground surface.

In the testing procedure the samples were bolted to the holder and the machine operated over a 100-hr. period. After the tests the specimens were again cleaned, measured, and weighed to determine wear. The wear is expressed by two measurements—weight loss in milligrams per 100 hr. and mean width loss in thousandths of inches per 100 hr.

The results of some field tests of plowshare cutting edge wear are also reported in which an attempt was made to obtain data on comparative wear of commercial plow materials and to study the work done by blacksmiths.

The results are a typical indication that soft-center steel shares are not hardened by the blacksmith in resharpening, and that they are not harder than ordinary steel shares.

How the plow works, M. L. NICHOLS (*Assoc. South. Agr. Workers Proc., 35 (1934), pp. 210, 211*).—A brief progress report is presented of studies at the Alabama Experiment Station on plow-moldboard operation and basic factors involved in moldboard shapes. All moldboards were found to be divided functionally into three sections, including the cutting share, a central pulverization area, and a turning and inversion area at the top.

It was found that the entire surfaces of all plows studied could be described by arcs of circles moving along and rotating on or directly above the line of travel of the tip of the wing. Some plows required two arcs; others required only one to describe the surface. A mechanism was devised for measuring the angle (Φ) of the plane of the arc and the line of travel, the angle (θ) produced by the elevation of the free end of the chord of the arc, and (t) the distance

of travel. The entire surface was described by parametric equations giving the relationships of the angles Φ, θ, and t, which are expressed by the general formula θ or $\Phi=ce^{kt}$.

It was found that the perpendicular differential sections of the pulverization area for all plows studied could be expressed by the type formula $z=ae^{bw}$.

The turning of the furrow slice was found to be accomplished by spiral easement or uniform-pressure curves, similar in principle to those employed in highway and railway engineering. Projections of the path of soil particles were found to be sections of logarithmic or equiangular spirals of the general formula $R=ae^{mw}$, where R is the radius, w the angle through which the radius has turned, and a and m constants. The banking or superelevation of this spiral was found to be proportional to the turning, that is $\theta=pe^{kt}$, where p and k are constants and the other symbols have the significance explained above.

Better plowing, T. Cleaver and R. I. Shawl (*Illinois Sta. Circ. 450 (1936), pp. 40, figs. 24*).—This circular, prepared in cooperation with the U. S. D. A. Bureau of Agricultural Engineering, includes sections on factors in good plowing, need for good trash coverage, field practices before plowing, choice of plows and plow parts, plow attachments and their adjustment, hitches and wheel adjustments, and selecting a new plow.

Studies on the use of the terracing plow for soil conservation, H. J. Harper (*Jour. Amer. Soc. Agron., 28 (1936), No. 4, pp. 301–309, figs. 3*).—At the Oklahoma Experiment Station "studies on the terracing plow were made to determine its limitations in a soil conservation program. It is an inexpensive tool and can easily be operated by the power available on the average farm. It was found that the effective height of terrace ridges could be increased by plowing twice in the same furrow for three or four rounds. When a riding plow is used, a deep narrow furrow slice should be moved toward the terrace ridge. A moldboard designed with the outer end flattened and bent slightly to the rear at a point about 22 in. from the edge of the landside will operate easier along crooked furrows, in soil where sods are frequently encountered, and in soil which tends to stick near the end of a straight moldboard.

"The draft of a terracing plow is very similar to that of a general purpose plow when operating under similar conditions. A plow operating in subsurface soil required about twice as much power as the same plow operating in surface soil.

"When terrace ridges are being constructed with a terracing plow, the land should be planted to small grain or some other crop which will cover the surface of the ground and reduce the erosion which may occur from breaks in the low ridges, unless the ridges can be plowed two or three times during the fall or winter in order to increase the effective height. When row crops are grown, the rows should be planted on a contour and parallel with the terrace ridge. The terracing plow was more useful than a backfilling plow or an ordinary plow in gully control work where soil is removed from the upper edge of a bank in order to establish a more vigorous growth of vegetation in the bottom of the ditch."

A pasture contour furrowing machine, C. A. Logan (*Agr. Engin., 17 (1936), No. 3, pp. 111–113, figs. 7*).—In a brief contribution from the U. S. D. A. Soil Conservation Service a pasture contour furrowing machine is described.

Fertilizer tests with corn planters, C. O. Reed, R. M. Salter, and E. E. Barnes (*Ohio Sta. Bul. 561 (1936), pp. 120–122*).—Progress results are briefly presented.

Power requirements in cotton ginning plants, V. L. Stedronsky (*Assoc. South. Agr. Workers Proc., 35 (1934), pp. 215–217*).—In a contribution from the U. S. D. A. Bureau of Agricultural Engineering the power requirements for cotton ginning are summarized.

A thresher for individual grain sorghum heads, M. H. BYROM and H. P. SMITH (*Agr. Engin., 17 (1936), No. 4, p. 162, figs. 2*).—A small machine to thresh and clean grain from individual heads of grain sorghum, developed at the Texas Experiment Station, is described.

The machine is designed to prevent grain from spitting back out of the feed hopper and grains from lodging in corners and on projections inside the housing about the cylinder and concaves. The machine thoroughly cleans itself after each head is threshed. It is also adjustable, compact, and sturdy.

The cleaner consists of a large funnel 30 in. long with a diameter of 16 in. at the large end and 6 in. at the small end. A 6-in. pipe 12 in. long forms an extension for the small end. A slotted baffle or grill is installed near the center line of the cleaner funnel and parallel to it to control the movement of the grain.

Field curing of hay as influenced by plant physiological reactions, T. N. JONES and L. O. PALMER (*Assoc. South. Agr. Workers Proc., 35 (1934), pp. 211–214*).—In studies conducted by the agricultural engineering division of the Mississippi Experiment Station, the practice of windrowing alfalfa hay was found to aid a continuation of the natural physiological process of transpiration, resulting in a greater moisture loss for a day's period. Double windrowing 2 hr. after cut furnishes hay with a better color, a larger percentage of leaves, and a lower moisture content at the end of the day.

Data indicate that the leaf of alfalfa plants aids greatly in lowering the moisture content of the entire plant. Photomicrographs showed a reopening of the stomata following windrowing 2 hr. after cutting. The process of crushing large-stemmed hays, such as Johnson grass and soybeans, will permit a needed change in methods and time required in curing.

Stirring air within desiccators, F. J. ZINK (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 6, pp. 442, 443, figs. 3*).—In a brief contribution from the Kansas Experiment Station a simple means of stirring air within desiccators is described, which was used in a series of investigations of equilibria moistures of forage hays and grains.

The equipment consists essentially of small fans mounted on pivots inside the desiccator which are induced to rotate by a series of mechanically moved permanent magnets passing near the outside of the desiccator.

Characteristics of spray nozzles for vegetable and weed spraying, O. C. FRENCH and A. S. CRAFTS (*Agr. Engin., 17 (1936), No. 3, pp. 115–119, figs. 9*).—In a contribution from the California Experiment Station data are presented, without conclusive statements, relative to the design of spray nozzle equipment for use in treating low-growing crops and applying herbicides and soil sterilants.

Light and its effects on plant growth, R. B. WITHROW (*Agr. Engin., 17 (1936), No. 4, pp. 150–152, 184, figs. 3*).—In a contribution from the Indiana Experiment Station a summary of progress in the subject is presented from which the conclusion is drawn that at the present time high intensities of artificial radiation cannot profitably compete directly with sunlight in commercial production of greenhouse crops. Artificial sources may, however, have commercial possibilities in aiding the grower to solve some of his dark weather problems as have occurred during the past winter.

Electricity serves the farm household, G. M. REDFIELD and T. E. HIENTON (*Indiana Sta. Circ. 214 (1936), pp. 12, figs. 10*).—This is a popular discussion of the possibilities of various appliances.

Sewage chlorination studies, W. RUDOLFS and H. W. GEHM (*New Jersey Stas. Bul. 601 (1936), pp. 72, figs. 27*).—Laboratory studies on sewage chlorination are reported.

An attempt was made to determine the chlorine consumption of sewage, the effect of chlorine on the flora and fauna, the effect of some physical and

chemical factors on the action of chlorine, and the effect of chlorine on oxidation. Sewages obtained from different sources were completely and partially chlorinated, and the quantities of chlorine required by different fractions (soluble, finely divided, and coarse suspended solids) were determined. To obtain a clearer picture, representative groups of substances present in sewage were treated singly in pure forms, allowing the indication of possible linkages of the chlorine with the compounds. It was found that with complete chlorination the settleable and soluble substances each consumed about 25 percent and the nonsettleable about 50 percent, but that on the basis of weight the finely divided material (colloidal and pseudocolloidal) consumed about 65 percent, the nonsettleable solids about 30 percent, and the settleable together with the soluble substances only 5 percent of the chlorine added. The quantity of chlorine consumed by the bacteria present is, for practical purposes, negligible.

The turbidity of settled sewage and of activated sludge increased upon chlorination. Portions of the dispersed materials became soluble, and the fraction made soluble consisted of nitrogenous substances.

Of the several methods tried to determine residual chlorine, a slightly modified orthotolidine test gave consistent results.

Bacterial removal (*B[acterium] coli* and 20° C. count) from sewage varied with the quantity of chlorine added, the contact time employed, and the types of substances present. The reduction in numbers of organisms, both *B. coli* and total bacteria, was followed by great increases after continuous incubation. In all cases, except when 100 percent of the chlorine demand was satisfied, growth increased in 6 hr. after chlorination, but none reached the original numbers until after 24 hr. of incubation. The aftergrowth was not directly proportional to the quantities of chlorine added. Microscopic examination of the sewage showed that with from 50 to 75 percent of the chlorine demand satisfied, the fauna was reduced to such an extent that no protozoa were present after 75 hours' incubation. The greater the initial reduction of bacteria the longer the lag, followed by a more rapid increase. The aftergrowth showed a predominance of the pseudomonas pigment-forming bacteria, indicating a selective action of the chlorine. A description of the chlorine-resistant organisms is given.

Split chlorination kills as many bacteria with the same quantity of chlorine as does addition in a single dose, but chlorine consumption is about 7 percent higher when chlorine is added in successive doses. Adding chlorinated sewage to unchlorinated sewage reduces the bacterial numbers in proportion to the final dosage of chlorine. These results indicate that by prechlorination and split chlorination the greatest use is made of the chlorine added.

Within the limits of from 5° to 37° neither bacterial reduction nor chlorine demand was appreciably affected by temperature in fresh or stale sewage. Increasing the speed and the time of mixing chlorine with sewage does not result in greater kill. Penetration of the chlorine with proper mixing is very rapid, and a single thorough mixing is all that is necessary to obtain maximum bacterial removal in up to 10 minutes' contact time. Hydrogen sulfide present in sewage may interfere to some extent with bacterial removal, but other substances produced during decomposition, which are usually present in stale sewage or settling tank effluents, are of greater importance. The same quantity of chlorine added to sewage but varying in strength from 100 to 1,070 p. p. m. did not cause any difference in the bacterial kill. In plant practice the concentration varies widely, depending upon the chlorine demand and the quantity of sewage as well as upon the type of chlorinator used. Maximum bacterial kill can be obtained, therefore, with any type of chlorinator or any

strength of chlorine, provided good mixing is allowed and chlorine consumption can be reduced by control.

The effect of chlorine upon biological oxygen demand (b. o. d.) reduction of carbon oxidation showed that when regular 5-day b. o. d. determinations are made the b. o. d. will be lower when a contact time of only 10 min. is allowed with chlorine and the same type and quantity of such material are used. The effect of the chloro products formed does not seem to extend beyond the first 6 days of incubation. Partial chlorination of sewage lagged behind unchlorinated sewage but was persistently greater than the sewages chlorinated to 100 percent of the demand. The 5-day b. o. d. reduction in 42 samples of different sewages was 2.4 p. p. m. for each part per million chlorine added, while samples of very stale sewage showed an average reduction of 2.6 p. p. m. biological oxygen demand for each part per million chlorine added. With shorter and longer incubation periods the b. o. d. reduction was less or more, depending upon the incubation time. The reduction of b. o. d. depends upon the quantity of chlorine added, but the total b. o. d. reduction is practically constant with quantities of chlorine added as low as 20 percent of the demand. Consequently, the more chlorine is added the less apparent b. o. d. is removed when calculated in parts per million b. o. d. reduction for each part per million chlorine added. The results are correlated with the effect of chlorine upon the soluble and semisoluble material.

During the first 5 days of incubation less carbon was oxidized from the chlorinated sewage than from the unchlorinated, but after 10 days' incubation the quantities of carbon oxidized were the same. Corresponding bacterial results explain the initial retardation and the following rapid rise in activity of the chlorinated sewages.

A list of 44 references to other work bearing on the subject is included.

AGRICULTURAL ECONOMICS

Agricultural economics: A selected list of references, compiled by M. G. LACY (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 1, rev. (1936), pp. 20*).—This revision of the bibliography previously noted (E. S. R., 53, p. 288) includes selected references on general economics, history of economic thought, agricultural economics, cooperation, credit, farm management, land economics, marketing, and rural sociology.

[Investigations in agricultural economics by the Maine Station, 1935] (*Maine Sta. Bul. 380 (1935), pp. 139–147, 178–185, 231–234, fig. 1*).—In addition to investigations previously noted (E. S. R., 74, pp. 272, 556), data are included as follows: Tables and discussion by W. E. Schrumpf on the cost of maintaining a work horse and tractors on Aroostook potato farms in 1933; tables and discussion by G. F. Dow, showing by items the cost per cow and the total cost per quart of producing milk in the Portland area, and the total cost by items and the average cost per quart for the four largest dealers in the Portland market of distributing milk and cream; and data by C. H. Merchant as to monthly distribution July 1931 to June 30, 1934, inclusive, of the cash expenses on potato farms in Aroostook County, and the percentages of total costs expended for labor, fertilizers, and taxes on potato, dairy, poultry, and general farms.

[Investigations in agricultural economics by the Ohio Station, 1934–35] (*Ohio Sta. Bul. 561 (1936), pp. 95–99*).—Results of investigations not previously noted are reported on as follows: Some general findings by J. I. Falconer and F. L. Morison in a study relating to agricultural land use in Ohio; a table with discussion by R. W. Sherman showing the yearly per capita consumption

of milk, cream, and condensed milk by 12,295 families in Cleveland; and a table with discussion by G. F. Henning showing for the same groups of the Cleveland families the preference for packer branded meats and the consumer's knowledge of the processing tax on hogs.

Current Farm Economics, Oklahoma, [April 1936] (*Oklahoma Sta., Cur. Farm Econ., 9 (1936), No. 2, pp. 41–64, figs. 3*).—Included are the usual tables and articles on Relationship of Monetary and Credit Policies to Agriculture (pp. 41–48), and The Agricultural Situation (pp. 61, 62), both by T. R. Hedges; Some Things to Be Considered in a Long-Time Agricultural Program, by C. P. Blackwell (pp. 48–52); Soil Conservation and Domestic Allotment Act, by E. E. Scholl (pp. 52–54); A Marked Increase in Oklahoma Farm Tax Delinquency from 1928 to 1932 Arose out of a Faulty Tax Machine and Severe Economic Strains on Farming (pp. 54–56), and Tenancy and Our Cotton Programs (pp. 56–58), both by J. T. Sanders; and Oklahoma Cooperative Vegetable Growers' Exchange, by A. W. Jacob (pp. 58–61).

Farm organization and management, G. W. Forster (*Ann Arbor, Mich.: Edwards Bros., 1935, pp. VIII+210, figs. 13*).—In this mimeographed textbook "an attempt has been made to integrate general economic principles as they apply to farm management and sound farm practices." The several chapters deal with the nature of modern farming; the nature, development, and problems of farm management; the factors affecting the choice and the selection and combination of farm enterprises; the units of measurement used in comparing farming success; specialized v. diversified farming; size of farm; selection and acquisition of the farm and equipment; rental contracts; the farm layout; managerial responsibilities; new forms of management in agriculture; farming practices; economic reports as aids to management; and credit for operating purposes.

An economic study of the broiler industry, P. R. Poffenberger, S. H. DeVault, and A. B. Hamilton (*Maryland Sta. Bul. 390 (1936), pp. 427–463, figs. 8*).—The results are reported of a study of 109 broiler farms for the year ended June 30, 1935, made to secure data on the cost of raising and marketing broilers; to determine the relative profitableness of broiler production and the factors affecting profits; and to secure data on feeding practices, brooding practices, losses from disease, principal causes of losses, marketing practices, and methods of sale. Some of the findings follow:

The averages per farm were number of broilers raised 8,231, investment $1,393, income $4,065, and cost, including unpaid family labor, $3,942. The returns per bird ranged from a net loss of 81 ct. to a net profit of 33 ct., averaging a net profit of 1.5 ct. Of the farms, 53.2 percent made a profit. Of the cost per bird, feed constituted 53.5 percent, cost of chicks 22.4, labor 7.7, marketing 5.7, overhead 5.5, and general expenses 5.2 percent. The gross income, cost, and investment were 57.2 ct., 44.7, and 15.2 ct., respectively, per bird on the most profitable farms, and 44.7 ct., 52.8, and 17.2 ct., respectively, on the least profitable farms. The most profitable size of enterprise was 5,000 to 15,000 birds per year. Feed, labor, and fuel costs per bird increased as the number of birds per farm decreased. Profits decreased as the percentage of mortality increased over 15 to 20 percent. The most profitable weight for marketing was 2.75 to 3 lb. The most profitable method of marketing was to local buyers and truckers, and the most profitable months were April, May, July, and December.

Some recommendations are made as regards production and marketing practices.

Grade and staple length of cotton produced in Georgia, 1928–35, N. M. Penny (*Georgia Sta. Circ. 107 (1936), pp. 8, figs. 2*).—Tables show by crop years

1928–35 the percentage distribution by grades of the American upland cotton ginned in Georgia and for the four districts of the State and the State as a whole the percentage distributions by staple lengths. Another table shows the staple length distribution for from 2 to 5 yr. in eight one-variety cotton communities.

Cotton and the AAA, H. I. RICHARDS (*Washington, D. C.: Brookings Inst., 1936, pp. XV+389, [figs. 20]*) —This volume is one of the series previously noted (E. S. R., 74, p. 871). The chapters deal with the legislative foundation of the cotton program; the cotton situation in the spring of 1933; the cotton program; cotton contract offers in 1933, 1934, and 1935; the administrative organization; promotional campaigns; the contract sign-up; checking compliance; the landlord-tenant problem; the Bankhead Act and operations under it; Government cotton and cotton loans; financing the program; the effects on foreign markets and on income; potential gains and losses; and the feasibility of continued control.

Appendixes include important benefit payment and processing tax provisions of the Agricultural Adjustment Act, as amended; the proposals for a 1934–35 cotton acreage reduction program; procedure under the Bankhead Act; and the method used in estimating the effects of a cotton program on incomes.

Tobacco under the AAA, H. B. ROWE (*Washington, D. C.: Brookings Inst., 1935, pp. XIII+317, [figs. 12]*).—This volume is one of the series noted above. The several chapters cover the legislative and policy basis for the program; tobacco growing and marketing; the tobacco situation in 1933; the tobacco program; marketing agreements; plans for controlling tobacco production; the operation of the production plans; financing the program; the results of the program in 1933 and 1934; and longer term possibilities and limitations of the production control program.

Appendixes include tobacco statistics; marketing agreement for flue-cured tobacco; other tobacco proposals considered; a summary of the tobacco production adjustment plans; articles of association and regulations for control; and the tobacco processing tax rates.

Livestock under the AAA, D. A. FITZGERALD (*Washington, D. C.: Brookings Inst., 1935, pp. XIII+384, [figs. 16]*).—This volume is one of the series noted above. The several chapters deal with the background of livestock adjustment; the Adjustment Act and its administration; the livestock program; emergency reduction of hog supplies; the contract and operations under the corn-hog reductions in 1934; the financing of the corn-hog program; the 1935 corn-hog program; problems and proposals for beef cattle; the drought and the cattle program; government loans on stored corn; early results of the AAA livestock program; the possibilities and limitations of the program; and prospective evolution under the amended AAA Act.

Appendixes include the corn-hog reduction contract; details of the 1934 corn-hog reduction campaign; important benefit payment and processing tax provisions of the Agricultural Adjustment Act, as amended; and statistical tables.

Marketing agreements under the AAA, E. G. NOURSE (*Washington, D. C.: Brookings Inst., 1935, pp. XII+446*).—This volume is one of the series noted above. Chapters describe and discuss the origins of the marketing agreement and licensing provisions of the AAA Act; agreement procedures and policy; volume and character of agreements and licenses; the wheat export, tobacco, peanut, rice, canning crops, dried fruits, and nuts agreements; the limitation and proration of shipments of perishable fruits; the citrus marketing agreements and national stabilization plans for the citrus market; agreements and licenses pertaining to dairy products; administrative

procedures and problems under the act; enforcement and legality; regulatory provisions and new marketing mechanisms; price objectives and strategy; and the results and future usefulness of market adjustment devices.

Appendixes include the marketing agreements for growers and shippers of California fresh deciduous tree fruits except apples and for packers of walnuts grown in California, Oregon, and Washington, and the sections of the Agricultural Adjustment Act covering marketing agreements and orders.

Transfers of farm real estate (*U. S. Dept. Agr., Bur. Agr. Econ., 1936, pp. 115*).—Tables show for 1933 or earlier years for 414 counties in 47 States the number of properties and acreages transferred by types of transfer and the average consideration in the case of bona fide sales.

Ratio of assessed value to consideration in bona fide transfers of farm real estate (*U. S. Dept. Agr., Bur. Agr. Econ., 1936, pp. 102*).—Tables show for 286 selected counties in 44 States for 1933 or earlier years the number of bona fide voluntary transfers, the acreage involved, consideration per acre, assessed value per acre, and the ratio of assessed value to consideration.

Crops and Markets, [March 1936] (*U. S. Dept. Agr., Crops and Markets, 13 (1936), No. 3, pp. 81–112, figs. 3*).—Included are tables, reports, summaries, charts, etc., of the usual form and the usual tables showing the acreage intentions for 1936 by States for different crops, and the acreages of such crops harvested in 1934 and 1935 and the average for 1928–32.

RURAL SOCIOLOGY

A social and economic survey of the Spencer soil-conservation area, F. D. Cornell, Jr. (*West Virginia Sta. Bul. 269 (1936), pp. 36, figs. 9*).—This study of the economic and social conditions of the people of a soil conservation area in the State was made cooperatively by the Soil Erosion Service of the U. S. Department of the Interior and the station. The area, comprising about 152,000 acres of land in Roane and Wirt Counties, was chosen because of its serious erosion problems and because the people were willing to cooperate.

The number of farms and the total population of the two counties have decreased since 1900. About 85 percent of the farms were located on dirt roads; more than one-half were farther than 5 miles from any market, while schools and churches were more accessible.

Wells, the chief source of water supply, were in many cases inadequately protected against surface run-off and seepage. A large percentage of the 743 farmhouses were in poor condition, and 200 had never been painted. Most of the farm operators and their wives had attended public schools. The number of children per farm family was 4.1, but an average of 5.58 persons lived in the operator's household at the time of the survey. There were 814 sons and 713 daughters of the farm operators who were either 21 yr. of age or were married. Of these, 41 percent of the boys and 47 percent of the girls had left the area. Only 20 of the 772 farm operators had not been born and reared on a farm.

The average size of farm was 134.5 acres; the average capital investment, $3,713, of which real estate represented nearly 85 percent. Eighteen percent of the total area in farms was in crops, 57.9 in pasture, and 19.5 percent in woods. Much crop production was on steep slopes, some of which were greater than 40 percent, necessitating considerable hand labor in farming. Little fertilizer was used, and the average yields were low.

The greater part of the farm receipts come from the sale of livestock and livestock products. Sixteen percent of the farm families included in the study had been on relief, averaging $26 per farm. The average total receipts per

farm were $387.35, of which 32 percent came from nonagricultural sources. The average labor income per farm was —$9.93; only 314 farms showed positive labor incomes. One hundred ninety-six farm owners reported mortgages against their farms, averaging $1,205.

Incomes are not adequate to meet mortgage obligations, maintain and conserve soil fertility, and provide adequately for the farm families. The methods necessarily employed in much of the area and the returns obtained from farming are not particularly alluring to the younger generation.

[Investigations in rural sociology by the Ohio Station, 1934–35] (*Ohio Sta. Bul. 561 (1936), pp. 99, 100*).—Included are tables by C. E. Lively showing the number of children, male and female, 16, 17, 18–20, and 21–24 yr. of age living in the parental home on January 1, 1929 and 1935, and the number of households of farm owners, farm tenants, and others in the open country, villages, and towns in 10 representative counties receiving public relief in October

FOODS—HUMAN NUTRITION

Food and nutrition [at the Hawaii Station] (*Hawaii Sta. Rpt. 1935, pp. 23, 24, 25, 26*).—This progress report (E. S. R., 73, p. 125) includes brief summaries of an extension of studies of the iodine content of 8 kinds of Hawaiian fish, moala crab, and eggs and the sterol content of avocado and other tropical oils. Data are also summarized on the carotene content of papaya, the vitamin A content of the opihi and the flesh and liver of the Hawaiian octopus, the sulfur content of mixed globulins of pigeonpeas and pigeonpea-seed meal; and proximate and mineral analyses are reported for commercial takuwan, fresh eggplant and eggplant pickled in salt, and rice bran paste.

Analysis of meat and fish used in high carbohydrate-low calorie diabetic diets, A. F. FOWLER and E. V. BAZIN (*Jour. Amer. Dietet. Assoc., 11 (1935), No. 1, pp. 14–17*).—Proximate analyses are reported for the edible portions of a number of meats and fish cooked in various ways and with the visible fat removed after cooking. A comparison of the values obtained with those reported in the literature for the same food items without removal of visible fat showed the fat content to be reduced sufficiently to permit a material increase in the amounts of these foods in the high carbohydrate-low calorie diabetic diet.

Digestion of milk and of modified milk in vitro, D. FETTER and F. W. SCHLUTZ (*Amer. Jour. Diseases Children, 50 (1935), No. 5, pp. 1101–1106, fig. 1*).—The experiments reported in this paper were carried out in order to note the comparative speeds of digestion at varying pH concentrations of certain milk modifications used in infant feeding, and the effect of adding rennin to the milk products. These included untreated cow's milk, Carnation milk, buttermilk, and Mead's powdered milk, protein milk, and lactic acid milk. All were prepared in such concentration that 100 cc contained approximately 4 g of protein. Fifty cc of the product was added to 50 cc of an artificial gastric juice composed of 0.5 percent HCl and 1 g of pepsin. To half of each mixture rennin was added as 8.5 g of junket. Adjustments in pH from 1.8 to 5 were made by the addition of sodium hydroxide or sodium carbonate. The bottles containing the various mixtures were placed in a rotating machine in an incubator at 37° C., and samples were withdrawn every 2 hr. for a period of 8 hr. for determinations of the soluble nitrogen.

At pH 1.8–3 the digestion took place as completely in the acid, and nearly as completely in the nonacid milk in the absence as in the presence of rennin, but at pH values between 4 and 5 little or no digestion took place without the rennin. In the tubes containing rennin the digestion was more rapid than in the tests at lower pH without rennin. The more rapid and complete digestion

of the milk at pH 4–5 in the presence of rennin held true for all of the milks except Mead's protein milk. Very little difference was shown by the different milks in the speed of digestion at the same pH, although untreated cow's milk, followed by evaporated milk, showed a somewhat slower digestion during the first 2 hr. than the other milks.

Digestion of milk and of modified milk in vivo, D. FETTER and F. W. SCHLUTZ (*Amer. Jour. Diseases Children, 50 (1935), No. 5, pp. 1107–1112*).—The milk modifications used in the in vitro study noted above were tested in vivo by determinations of the soluble nitrogen in the gastric contents of 5 children from 7 to 14 yr. of age after the ingestion of 200 cc of the milk, samples being withdrawn 10 min., ½ hr., and every half hour thereafter up to from 1½ to 2½ hr. As thus determined, buttermilk and cow's milk with rennin (junket) had the most rapid speed of digestion, followed by protein milk, lactic acid milk, evaporated milk, and evaporated milk with junket, then by powdered milk and powedered milk and junket, and finally by untreated cow's milk.

Biological and biochemical studies on the content of ascorbic acid in chlorophyll- and nonchlorophyll-containing vegetables [trans. title], L. RANDOIN, A. GIROUD, and C. P. LEBLOND (*Bul. Soc. Chim. Biol., 17 (1935), No. 12, pp. 1649–1676, figs. 7*).—In this comparison of the vitamin C content of chlorophyll- and nonchlorophyll-containing vegetables, two criteria of richness in vitamin C were used—the chemical determination of ascorbic acid in the materials by the Tillmans reducing test and the results of guinea pig feeding tests, including not only growth and presence or absence of scurvy symptoms but the content of ascorbic acid in various organs.

The ascorbic acid values of the materials used were carrot, green leaves 0.81 and root 0.054 mg per gram of fresh tissue; turnip, green leaves 1.5 and root 0.3 mg; black salsify, green leaves 1 and root 0.157 mg; endive, green leaves 1, root 0.122, and etiolated leaves 0.091 mg; lettuce, outside green leaves 1.914 and inner white leaves 0.493 mg; leek, green part 1.26 and white part 0.32 mg; and chard, green leaves 1.103 and white midrib 0.19 mg per gram of fresh tissue.

From the ascorbic acid values of the green materials, the limiting doses of the material were calculated for slightly subnormal nutrition and protection of guinea pigs on a scorbutic ration, and both green and bleached materials were fed in the same amounts. With the exception of lettuce, which seemed to give equally good results for the green and white leaves, probably because the dosage was too high to detect slight differences, all of the green materials afforded much better protection than the white, with higher storage in the various organs, particularly the adrenals. It is concluded that the antiscorbutic value of chlorophyll-containing tissues is greater than that of nonchlorophyll-containing tissues, and the possibility is suggested that ascorbic acid plays a part in the function of chlorophyll.

The effect of grape as compared with other fruit juices on urinary acidity and the excretion of organic acids, R. C. CLOUSE (*Jour. Nutr., 9 (1935), No. 5, pp. 593–610, figs. 6*).—This paper is a further contribution to the general series of reports from the department of home economics, University of Chicago, on the effects of certain foods, particularly fruit and vegetable juices, on urinary acidity. The most recently noted of these reports is by Schuck (E. S. R., 73, p. 719). In the present study the effects of bottled apple juice, fresh orange juice, and bottled Concord grape juice upon the urinary acidity and total organic acid output of normal adult women subjects were compared. The ingestion of orange juice in amounts of 500 or 1,000 cc daily had a more marked effect upon the alkalinity of the urine, as measured by an increase in

pH and a reduction in titratable acidity and ammonia, than the ingestion of either grape or apple juice. The effects of both bottled Concord grape juice and apple juice (sweet cider) were variable, but that of the grape juice was usually in the direction of alkalinization and apple juice of increased acidity of the urine. Both grape and orange juices tended to increase and apple juice to decrease the CO_2-combining power of the blood. The grape and orange juices increased the excretion of organic acid in the urine, while apple juice decreased the organic acid output. The increase in organic acid output observed on both the orange and grape juice diets was shown to be due in part to an increased excretion of uric and citric acids and not entirely to the excretion of unoxidized remnants of individual fruit acids. This is thought to support the suggestion advanced in previous papers that the organic acids play a significant role in the maintenance of acid-base balance in the body.

Eating utensil sanitation, J. G. CUMMINGS and N. E. YONGUE (*Amer. Jour. Pub. Health, 26 (1936), No. 3, pp. 237–244, figs. 3*).—This report deals with both laboratory and field investigations of the use of chlorine disinfection in the washing of eating and drinking utensils, both by hand and by machine.

Data are reported showing that the presence of organic matter on the utensils and the carrying over of residual soapy water into the rinsing water increase to a marked extent the amount of chlorine required for disinfection. For mechanical two-compartment dishwashers, the use of a chlorine solution in the rinsing water compartment, as well as the washing compartment, is recommended. For hand dishwashing, a method recommended as the most satisfactory but not altogether practical is "first, to rinse off the organic food particles in running hot water, second, to wash in an alkali cleanser, as trisodium phosphate-chlorine solution, and third, to immerse in a suitable chlorine solution. When all the dishes of the first set have been placed in the third compartment containing chlorine solution, they should remain there until the second set have reached the second compartment. Thus there is the necessary time exposure in the two disinfecting solutions of 8 to 12 min. The water should be maintained at hot hand washing temperature, which is about 120° F."

The probable accuracy of dietary studies, M. KOEHNE (*Jour. Amer. Dietet. Assoc., 11 (1935), No. 2, pp. 105–109, fig. 1*).—Conditions under which dietary studies made by weighing the foods eaten during a minimum period of 1 week are representative of the customary food intakes of the individuals are discussed, chiefly on the basis of an analysis of the weekly records in comparison with final averages obtained for 5 of the 28 children taking part in a previously noted dietary study (E. S. R., 71, p. 877).

The national food supply and its influence on public health, J. B. ORR (*London: P. S. King & Son, 1934, pp. 20*).—In this Chadwick lecture for 1934, both the economic and the public health aspects of the maintenance of the food supply of Great Britain are discussed. In considering the economic aspects, the development of food production in England and the dominions during the past 100 yr. is outlined, with the resulting problem of overproduction of certain commodities, the effect of this overproduction on agriculture in England, and the present attempt to meet the situation by tariffs, subsidies, and limitations of imports.

Under the public health aspects of the food supply, evidence is presented of an unsatisfactory state of health and nutrition among various groups in England and Scotland, with the question, "Why does this malnutrition exist when food is so plentiful?" Ignorance, improvidence, and inefficiency of the housewife are considered to be largely responsible, "but it must also be attributed to some extent to poverty. Foodstuffs which are of special value for

maintaining health are unfortunately more expensive than those which are known to be markedly deficient in certain nutrients required for health." This raises the further question, "How can we make agriculture profitable and maintain a rural population and at the same time enjoy the benefits of cheap food?"

Various methods of attacking the problem are discussed, in particular the recommendations of the Elgin Committee on Agriculture appointed by the Scottish National Development Council to outline a national policy for Scotland. The main feature of these recommendations is the complete reorganization of methods of distribution to reduce the wide and growing difference between the price the producer gets and the consumer pays. Under the plan proposed the present marketing boards would establish central depots for the sale of certain main foodstuffs. "The produce would be moved from the farm direct to these centers where it would be graded and payment made to the farmer according to quality. At the centers it would be subjected to whatever process was necessary to make it ready for the consumer. Fat stock would be slaughtered and dressed. Milk would be pasteurized when necessary and bottled. The retail distributor would get his goods from this center."

It is pointed out that this policy has been presented and discussed simply to show that there is an alternative to the policy of raising prices by quotas and restrictions, but that the relative value of the various schemes which have been suggested is still a matter of opinion.

Food and the nation (*Nature* [*London*], *136* (*1935*), *No. 3446, pp. 771–773*).—This editorial discussion is based upon a program of planned agriculture to meet consumers' needs (in Great Britain), with the control of the distribution of foodstuffs in the hands of the present marketing board with power to make staple foodstuffs available at a special low price to the poorest classes as recommended in the above-noted lecture by Orr.

Food, health, and income, J. B. Orr (*London: Macmillan & Co., 1936, pp. 72, figs. 21*).—This report gives a general account of an investigation conducted by the staff of Rowett Institute in cooperation with the Market Supply Committee to determine the adequacy of the diet with relation to income of the people of Great Britain. The total quantities and retail values of the main food supplies of the United Kingdom in 1934 were estimated and the quantities and prices of each per head per week calculated. The nature of the diet in different sections of the country was next ascertained by examining the data of a number of dietary surveys comprising over 2,500 family budgets, ranging from very poor families spending less than 2s. per head weekly on food up to families with an income of £2,000 per annum and spending 15s. or more per head weekly on food. The budgets were first arranged in six groups according to the income per head, this being obtained by dividing the total family income from all sources by the number of persons irrespective of age and sex supported by that income. Commenting upon this manner of calculating income, the author points out that the terms higher and lower income groups do not correspond with the terms rich and poor in the ordinary sense of the word, for a man earning £550 a year but with a wife, 4 children, and 1 servant would belong in the same income group as a manual laborer earning £3 a week (£156 a year) but with only a wife to support. The average food expenditure in each income group and the average amount and value of each food purchased per head per week were calculated.

The composition of the average diet of each group was then examined, and the amounts of each of the food constituents present were compared with the amounts required for health. The standard adopted for health was the physiological or ideal, defined as "a state of well-being such that no improvement

can be effected by a change in the diet." The standards of dietary requirements were those of U. S. D. A. Circular 296 (E. S. R., 70, p. 416). Finally the state of health of the country was reviewed on the basis of recent investigations to form an idea of the extent to which inadequacy of the diet is reflected in poor physique and impaired health. The data are presented as far as possible in tables and graphs, the more detailed information being given in a series of appendixes. The main findings are summarized essentially as follows:

Of an estimated income of £3,750,000,000, about £1,075,000,000 is spent on food. This is estimated to be equivalent to 9s. per head per week. The consumption of bread and potatoes is practically uniform throughout the various income level groups, while that of milk, eggs, fruits, vegetables, meat, and fish rises with the income. Items considered of particular interest are a range from the lowest to the highest income groups of from 1.8 to 5.5 pt. of milk and from 1.5 to 4.5 eggs, and an expenditure of from 2.4d. to 1s. 8d. for fruits per head per week.

The degree of adequacy of the diets increases as the income rises. "The average diet of the poorest group, comprising 4,500,000 people, is, by the standard adopted, deficient in every constituent examined. The second group, comprising 9,000,000 people, is adequate in protein, fat, and carbohydrates, but deficient in all the vitamins and minerals considered. The third group, comprising another 9,000,000, is deficient in several of the important vitamins and minerals. Complete adequacy is almost reached in group IV, and in the still wealthier groups the diet has a surplus of all constituents considered." It is estimated that to make the diet of the poorer groups the same as that of group IV would involve increases in consumption of a number of the more expensive foodstuffs of from 12 to 25 percent.

As has been shown in tests on children, the improvement of the diet of the lower groups is accompanied by improvement in health and increased rate of growth. "A review of the state of health of the people of the different groups suggests that as income increases disease and death-rate decrease, children grow more quickly, adult stature is greater, and general health and physique improve."

A nutritional survey (*Brit. Med. Jour., No. 3924 (1936), pp. 587, 588*).—This editorial discusses the scope and presents some of the findings of the report of Orr noted above, with the comment that "this report, while admittedly based in some respects on scanty data, deals with the problem of national nutrition on such a large scale and yet in such detail that it will prove of great value to workers in very many fields, and deserves study by all."

Food, health, and income (*Pub. Health [London], 49 (1936), No. 7, pp. 249, 250*).—In this editorial some of the more important findings in the report of Orr, noted above, are summarized, with the comment that "the problem, as these findings show, is not one easy to solve, for the reason mainly that it is so very completely economic and political."

The relation of food to health and disease: Nutrition ([*Gt. Brit.*] *Min. Health, Chief Med. Off. Ann. Rpt., 1934, pp. 104–108*).—This material discusses the scope, limitations, and legitimate applications of qualitative and quantitative dietary surveys, and methods of studying nutritional status and determining the effect of food supplements on health.

It is emphasized that it is not justifiable to use the results of qualitative surveys to calculate the amounts of different nutrients consumed. "Qualitative studies can only provide evidence as to the types of foods consumed, and from this it can be ascertained whether a reasonably mixed diet is achieved or whether excessive amounts of some foods and too little of others are be-

cluded in the dietary." In the discussion of quantitative dietary surveys it is pointed out that, in calculating the amounts of edible nutrients in the total amounts of different foods consumed over the period, analyses are still lacking for many important constituents of the diet. "Only when knowledge of food chemistry and of physiology has advanced to such a stage as to make it possible to state the amounts of the 20 or so essential nutrients in foods used for human consumption and the requirements for health will one be able to place an exact value on human diets."

As an objective means of judging nutritional status supplementing clinical examination, objective intensive tests of voluntary neuromuscular efficiency have been conducted by means of a special dynamometer in a school near London. After 212 boys between the ages of 12.5 and 19 yr. had been tested and their maximum lumbar pulls compared with their weights, it was found that the ratio, pull in pounds over weight in pounds, was equal to 2.42±0.013. The possibility of using this test as one measure of the state of nutrition of children is being investigated further.

Food values at a glance and how to plan a healthy diet, V. G. PLIMMER (*London and New York: Longmans, Green & Co., 1935, pp. 94, [pls. 27, figs. 6]*).—This small volume is in a sense a supplement to the one by R. H. A. Plimmer and the present author originally called Food and Health and later Food, Health, and Vitamins (E. S. R., 69, p. 303). The frontispiece consists of the graphic "square meal" chart described previously (E. S. R., 56, p. 290), and at the end of the book a series of charts presents in a similar graphic way common foodstuffs, with their various constituents "distinctively colored like the layers of a Neapolitan ice and branded with their vitamin content. . . . By means of these charts the composition of any foodstuff can be rapidly compared with that of any other food without recourse to figures."

The text contains up-to-date information summarized in nontechnical language on the general principles of nutrition and diet planning, with sample model diets for various age groups, menus and quantities of foodstuffs for a week modeled on the actual diet of a girls' school in which the catering was well planned, and an inexpensive diet for a family consisting of father, mother, and three children, total man value 3.45.

The health of Glasgow school children (*Pub. Health [London], 49 (1936), No. 7, pp. 244, 245*).—This editorial summarizes certain data from the report by G. A. Brown on the medical inspection and treatment of school children in Glasgow for the year ended July 31, 1935. Attention is called to the claim that the heights and weights in nearly every age group were greater than any recorded in similar inspections during the past 15 yr., and that the average nutritional condition of the children was the best recorded since 1919. The introduction on March 4, 1935, of a daily milk ration available to about 78 percent of the children is thought to have been largely responsible for the accelerated rate of growth.

Nutrition of children in Maine (*Maine Sta. Bul. 380 (1935), pp. 235–238*).—This progress report includes a brief summary of a comparison of weight-height-age data and capillary resistance values for winter and spring, by M. M. Clayton and M. D. Sweetman, in the investigation noted in the previous report (E. S. R., 73, p. 560), a discussion of the scope and a few preliminary findings in an extension of this investigation, and a brief note on the antiscorbutic value of home-made pickles, by Clayton.

Growth in height and weight in college and university women, R. G. BARKER and C. P. STONE (*Science, 83 (1936), No. 2142, pp. 59–61*).—Attention is called to the fact that the mean height and weight measurements of college women obtained from independent samples of the population at successive ages

have shown no consistent changes associated with advancing age, while the data on consecutive annual measurements for the same individuals indicate that there is a small but significant increase in these measurements throughout the four college years. These apparently contrary findings were confirmed in the analysis by the two methods of height and weight measurements of 1,290 Stanford University women students, of whom 1,134 were remeasured after 1 yr. and 446 after 2 yr. When the mean measurements for independent samples at these successive ages were compared, the differences from year to year were not consistent or statistically significant, but when the mean heights and weights of the same students in successive years were computed, small but significant mean annual and biennal increases in height were found and significant increments in weight The total increment in height for the 4-yr. period was 0.4 in. and in weight 5 75 lb.

"In presenting this note the authors hope not only to point out the methodological basis of an apparent discrepancy in the results of different investigators, but also to stimulate others to search in the archives of physical education departments for publishable consecutive measurements of physique, and to encourage departments which do not repeat the measurements to do so in order that a sizable mass of consecutive measurements may be assembled. Probably the best sources of data by means of which the terminal phase of physical development may be studied at the present time are the college and university populations."

Low cost diets for pregnancy and lactation, B. B. EDWARDS (*Med. Woman's Jour., 42 (1935), No. 6, pp. 150–155*).—This article contains a food list selected for adequacy and low cost for one week for a pregnant or nursing woman with tabulated analyses and a discussion of the diet for distribution of calories and cost among different food groups, the content of protein and minerals as compared with standards, the contribution of various food groups to the mineral content of the diet, and the vitamin units in comparison with tentative requirements.

Studies on lactation, II, III (*Jour. Nutr., 9 (1935), No. 5, pp. 575–592, figs. 2*).—Two papers are presented.

II. *Technic for studying lactation in rats,* R. G. Daggs (pp. 575–580).—In the technic described the litters are reduced to 6, the growth data are plotted from the fourth instead of the first day of life, and as final data only so-called perfect experiments are included, "i. e., experiments where the mother has shown no signs of ill health and has successfully cared for all her young remaining after suitable reduction of the litter at birth." The growth data are finally analyzed essentially as described by Brody (E. S. R., 58, p. 352), except that ordinary instead of natural logarithms are used. The logs of the daily weights of the litters from the fourth to the seventeenth day of life are plotted against time in days. Straight lines are then drawn through the greatest number of points. For this growth period a break occurs generally at about the tenth day, thus making two straight lines. For the slope of each of these a numerical constant is obtained by dividing the log difference between any two points on the line by the distance between them in days. The two constants are then added and the resulting figure, after dropping the decimal, is called the lactation index.

The authors are of the opinion that "this method is a more accurate picture of the growth changes in the young due to lactation changes in the mother than is presented by any other existing means of judging lactation in rats."

III. *Effect of various dietary principles on lactation in rats,* R. G. Daggs and R. L. Tomboulian (pp. 581–592).—The method described above has been used to test the effect of various food factors on lactation in rats [illegible]

rials were fed either in place of the casein of the basal diet or as daily supplements.

As judged by the lactation indexes obtained, "the lactation promoting factor was found to be present in liver, egg, round, kidney, alcohol-water extract of liver, diets of higher protein level (egg casein), water extract of autolyzed liver or egg, Witte's peptone, blood fibrin, lactalbumen, cystine, and a combination of 1 part cystine, 1 part glycine, and 1 part glumatic acid fed with only 12 parts of casein and the other constituents of the basal diet. This last mixture which simulates glutathione gave the best results, although cystine alone as supplement showed a remarkable effect. The factor was not present in the unsaponifiable fat of egg, in lecithin, extra wheat germ oil, extra cod-liver oil, extra lard, Armour's peptone, glycine, or K_2S. The authors believe that cystine or glutathione acts in some way as a mammary stimulant."

Fat formation from sucrose and glucose, S. FEYDER (*Jour. Nutr., 9 (1935), No. 4, pp. 457–468*).—By the paired feeding method the relative efficiency of dextrose and sucrose as the chief source of energy was tested on 9 pairs of rats. Without exception the sucrose animal in each pair gained weight more rapidly than the dextrose animal, the results being statistically significant.

Control young animals and 7 pairs of the survivors after from 16 to 29 weeks of feeding were killed and their bodies analyzed for nitrogen, glycogen, and total fat, with results indicating that the difference in weight gains on the sucrose and glucose was due principally to fat. "It is concluded, therefore, that sucrose has a considerably greater fattening effect in the rat than dextrose."

Rates of absorption and glycogenesis from various sugars, S. FEYDER and H. B. PIERCE (*Jour. Nutr., 9 (1935), No. 4, pp. 435–455, figs. 3*).—This investigation was undertaken (1) to redetermine the rate of absorption of glucose from the alimentary tract of rats and (2) to compare this rate with that of other sugars requiring some digestion and to determine the relative rates of liver glycogen formation from these sugars. The animals were fasted 24 hr. and then fed 2.5 cc, with one or two exceptions, of the various carbohydrates by stomach tube. After 1, 2, and 3 hr. the rats were killed by a blow on the head, the gastro-intestinal tracts were removed and washed, and the unabsorbed sugars in the washings were determined. The livers were immediately plunged into hot 30-percent KOH for subsequent glycogen determinations.

The absorption of glucose from the alimentary tract did not take place at a constant rate and varied in total amounts and in the amounts absorbed per 100 g body weight per hour. A slightly closer relationship was evident between absorption and body surface than between absorption and body weight.

The rate of glycogenesis in the liver was approximately the same for dextrose and sucrose during the first and second hours, but during the third hour the rate of glycogenesis from the dextrose decreased, with sucrose forming approximately 44 percent more liver glycogen than did dextrose. This difference is attributed to the presence of fructose in the sucrose molecule.

The rate of glycogen formation from corn sirup was lower than that from either dextrose or sucrose and was fairly constant during the three hourly periods of absorption.

Intestinal stasis in low mineral diets, E. C. ROBERTSON and M. E. DOYLE (*Jour. Nutr., 9 (1935), No. 5, pp. 553–567, figs. 4*).—Using carmine as the feces marker, the authors have demonstrated that young rats fed a diet low in minerals but otherwise adequate developed a marked intestinal stasis. The stasis was not relieved by additional vitamin B complex. That a deficiency of sulfur, iodine, manganese, iron, or aluminum was not responsible for the stasis was demonstrated by the fact that in rats fed the adequate diet plus the McCollum salt mixture 51, which contains none of these elements, the

evacuation of the carmine was as rapid as in the controls receiving the Osborne and Mendel salt mixture. The motility was not affected by the presence or absence of sodium chloride, but the simultaneous addition of calcium carbonate and potassium carbonate to the mineral-deficient ration relieved the stasis.

It has not yet been established conclusively whether both potassium and calcium salts must be added to prevent the stasis, "but this would appear to be the case. It is interesting to note that numerous investigators working on other physiological problems have emphasized the importance of the K/Ca balance in maintaining the well-being of animals. On looking through the analyses of foods, one is struck by the fact that practically all of the laxative foods fed to young children are very high in potassium."

The effect of diet on the hemoglobin concentration of the blood, L. N. ELLIS and O. A. BESSEY (*Amer. Jour. Physiol., 113 (1935), No. 3, pp. 582–585*).—Normal rats from a single colony, the inbreeding of which for many generations made heredity an uncomplicating factor, were used for hemoglobin determinations at the age of 1 yr. to study the influence of diet on the maintenance of hemoglobin in connection with adult activities, and young animals at the age of 1 mo. to study the effect of the same diets on regeneration of hemoglobin during recovery from the anemia of infancy. The diets were the whole wheat-whole milk powder diets A and B of Sherman and Campbell, diet B with the addition of raw beef and fresh string beans, diet B with the substitution of some of the whole wheat by casein, and a diet (H) containing a mixture of foodstuffs representative of human dietaries.

In the young animals the hemoglobin concentration increased with the iron content of the diet in the order diets H, B, B+casein, and A. Although the iron content of the diet B+meat+beans was slightly lower than diet H, the hemoglobin values were somewhat higher. The lowest hemoglobin value in the entire series was 9.2±0.5 g per 100 cc and the highest 12.6±0.3 g per 100 cc. Corresponding values for the iron content of the respective diets were 2.89 and 3.68 mg per 100 g. At 1 yr. of age the differences in hemoglobin values were small, the lowest being 14±0.4 g per 100 cc for females on diet H and the highest 16.2±0.3 for males on diet B+meat+beans. This diet and diet B+casein gave significantly higher values than the other three.

Hemoglobin determinations made on animals on diets B and B+meat+beans at 60 and 90 days to determine at what period the latter diet became superior revealed an evident superiority for both sexes at 60 days. The hemoglobin increase for the females was 3.5 g per 100 cc as against 1.8 g on diet B. The superiority of this diet and diet B+casein was also shown by the attainment of greater adult weight on both these diets than on the other three.

Studies of phosphorus of blood.—IV, Phosphorus partition in the blood of children with disease, G. STEARNS and E. WARWEG (*Amer. Jour. Diseases Children, 50 (1935), No. 5, pp. 1164–1172*).—In continuation of the series noted previously (E. S. R., 73, p. 417), data are reported and discussed on the alterations in the blood phosphorus in certain diseases of infants and children, including rickets, tetany, or osteoporosis, osteomyelitis, conditions of hypercalcemia, and nephritis or nephrosis.

"In all of the children studied, malnutrition seemed to be accompanied by somewhat decreased or low normal values for ester phosphorus of the whole blood; similarly the inorganic phosphorus content of the serum was near the lower limit of normal. A prompt rise in these components was observed as the child's nutritional status improved. Only in the children with untreated celiac disease was the degree of malnutrition severe enough to cause marked changes in ester phosphorus."

The indispensability of zinc in the nutrition of the rat, F. E. STIEBN, C. A. ELVEHJEM, and E. B. HART (*Jour. Biol. Chem., 109 (1935), No. 1, pp. 347–359, figs. 2*).—In this contribution from the Wisconsin Experiment Station, further evidence is presented substantiating the earlier conclusion that zinc is an essential element for the nutrition of the rat (E. S. R., 73, p. 417). As a possible explanation of the contrary results reported by Newell and McCollum (E. S. R., 70, p. 717), it is suggested that their rats were receiving an adequate supply of zinc from the casein and yeast of the experimental diet, for attempts to free zinc from these constituents by the same methods had been unsuccessful.

Since zinc has been found essential for rats and mice, it is considered that it is probably needed by all animals but that most natural rations contain a sufficient amount of this element. Attention is called, however, to the report by Finch and Kinnison (E. S. R., 69, p. 379) of a naturally occurring zinc deficiency in the pecan trees in certain areas of Arizona. This disease is promptly alleviated by the administration of zinc salts. Analysis of the drainage waters from areas in which this disease occurs showed a very low zinc content. The possibility is suggested that in areas such as these zinc may be a limiting factor in both plant and animal nutrition.

Nutrition investigations (*Connecticut [New Haven] Sta. Bul. 381 (1936), pp. 173, 174*).—This progress report (E. S. R., 73, p. 284) discusses certain changes that have been made in the stock diet of experimental rats of the Osborne-Mendel strain, and notes a continuation of the investigation by A. H. Smith and W. E. Anderson of reproduction in the albino rat and preliminary results of a study, in collaboration with L. G. Rowntree, of the effect of injection of thymus extract on the growth of young rats.

The subdivision of the metabolic nitrogen in the feces of the rat, swine, and man, B. H. SCHNEIDER (*Jour. Biol. Chem., 109 (1935), No. 1, pp. 249–278, figs. 7*).—A further investigation of the relation of the metabolic nitrogen of the feces to body weight and food intake of rats (E. S. R., 72, p. 873), with an extension of the investigation to swine and human subjects, is reported in considerable detail.

With rats and swine, the metabolic nitrogen of the feces appeared to be divided into two fractions. One of these varied directly with the quantity of food dry matter consumed, and the other was a constant fraction probably of true excretory origin. In rats the constant fraction of metabolic fecal nitrogen was definitely related to body size, amounting to about 240 mg per square meter of body surface. With swine the relationship of the constant fraction to body size has not been shown as clearly, but the average value in relation to body surface was nearly the same, 220 mg per square meter. With human subjects all of the metabolic fecal nitrogen varied in proportion to the intake of dried food.

"The ratio of metabolic fecal nitrogen to food dry matter consumed is very nearly constant with rats and pigs if the food intakes are not so low as to induce losses in body weight. With humans the ratio is not at all affected by variation in food intake. Hence, for use in the estimation of the true digestibility of proteins and of their biological values, this ratio is valid for rats, pigs, and humans under all conditions favorable to the most accurate determination of biological values by the Mitchell method."

G. Grijns' researches on vitamins, 1900–1911 (*Gorinchem, Netherlands: J. Noordhuyn & Son, 1935, pp. XVIII+254, pl. 1, figs. 2*).—This volume, which was assembled in homage to G. Grijns on the occasion of his seventieth birthday, contains a list of members of the International Committee of Homage, a photograph and biography of the author, English translations of the series of

papers originally published in Dutch covering his classic researches on vitamins from 1900 to 1911, a German translation of his doctorate thesis on the physiology of the nervous opticus, and a complete bibliography of his publications.

In the biography the relationship of Grijns' researches on the antineuritic vitamin to the earlier work of Eijkman and to the later work of Holst on ship beriberi and scurvy is brought out. In the opinion of the committee Grijns, in definitely disproving the toxin theory concerning the nature of the disease caused by the too exclusive use of highly polished rice and demonstrating the curative nature of the silver skin of rice and certain other substances, "was the first to set forth clearly what is to be justly called a deficiency disease and to study systematically the properties and distribution of a vitamin."

Vitamins in theory and practice, L. J. HARRIS (*Cambridge: Univ. Press, 1935, pp. XIX+240, figs. 66*).—In this small volume the subject matter of a series of four popular lectures, given at the Royal Institute in London in 1934, is presented in nine chapters abundantly illustrated with photographs, charts, and figures. The final chapter, entitled Dietetics—What to Eat, deals with the practical applications of present knowledge of the vitamins.

Effect of vitamin A on proliferation of fibroblasts, L. E. BAKER (*Soc. Expt. Biol. and Med. Proc., 33 (1935), No. 1, pp. 124–126*).—In this preliminary report it is announced that highly purified concentrates of vitamin A, prepared from halibut-liver oil by methods described by Holmes et al. (E. S. R., 71, p. 584), when dissolved in chicken sera and added in appropriate concentration to a nutrient fluid containing heart fibroblasts promoted growth of the cells at a much more rapid rate than that of control cells, and also prevented the accumulation of large amounts of fat in the cells and enabled them to live and proliferate in the artificial medium for a much longer time.

Vitamin B_1 and thyroxin, B. SURE and K. S. BUCHANAN (*Soc. Expt. Biol. and Med. Proc., 33 (1935), No. 1, pp. 77, 78*).—This is a preliminary report of an extension of an earlier study by Sure and Smith (E. S. R., 72, p. 885), in which a protective action of vitamin B against the toxicity of thyroxine was demonstrated, to an investigation of the quantities of two vitamin B_1 concentrates necessary to balance the toxic influence of thyroxine in rats. The vitamin B_1 preparations were Williams' crystalline vitamin B_1 (Merck), which was administered daily in quantities ranging from 1γ to 300γ, and a vitamin B_1 concentrate furnished by the Eli Lilly Research Laboratories. This concentrate, each cubic centimeter of which contained 150 Sherman units, was administered in doses supplying from 1.5 to 30 Sherman units daily. The thyroxine was given daily in doses ranging from 0.05 mg to 0.2 mg. The rats were compared in groups of 4 of the same sex from the same litter on a vitamin B_1-deficient diet with no supplement and supplemented with one of the preparations of vitamin B_1, thyroxine, and both B_1 and thyroxine, respectively. The criterion of complete protection against thyroxine was the ability of the animals to grow as well as the controls without thyroxine.

With the Lilly concentrate, the best protection, 75–100 percent, was secured when a dosage of 0.05 mg thyroxine was matched against from 7.5 to 15 Sherman units of the concentrate. About two-thirds protection was secured with 0.1 mg of thyroxine and 15 units of vitamin B_1, and prevention of loss in weight but only a little growth on 0.2 mg thyroxine with 30 units of vitamin B_1. With the crystalline vitamin B_1, satisfactory protection was secured on 10γ against 0.05 mg of thyroxine, but quantities as high as 300γ did not protect against 0.1 mg and 0.2 mg of thyroxine.

The difference in behavior of the two vitamin B_1 concentrates is thought to point "to the existence of an essential component of the vitamin B complex for the mammalian organism other than vitamin B_1 and vitamin B_2 [illegible]

latter being furnished in abundance in our diet by 15 percent autoclaved beef)—possibly B_4, as originally suggested by Reader."

The vitamin C content of apples and its relation to human welfare, W. F. Dove and E. Murphy (*Science, 83 (1936), No. 2153, pp. 325–327; abs. in Maine Sta. Bul. 330 (1935), pp. 203, 204*).—In this brief contribution from the Maine Experiment Station, the literature on variations in the vitamin C content of apples is reviewed, and the results are summarized of preliminary tests on the ascorbic acid content of leaves of two varieties of apples—one high in vitamin C (Northern Spy) and the other low in vitamin C (McIntosh). The titrimetric determinations, following the technic of Bessey and King (E. S. R., 71, p. 137) except for the use of cold instead of hot acetic acid, were made in September and October during and immediately after apple harvest time. In 14 of the 17 tests the ascorbic acid values of the leaves of the Northern Spy were higher than those of the McIntosh, with average values of 1.1203 and 0.7457 mg per gram, respectively. It is stated that further tests are in progress in order to determine the earliest time at which these differences in the ascorbic acid content of the leaves or other nonfruit parts of the plant are detectable. "If the method proves successful and adaptable to other fruits and vegetables, it will make possible a 'vitamin sieve' to precede all other tests of adaptability, winter hardiness, consumer preference, and trade demands."

The lack of vitamin D in common foods, J. Coffin (*Jour. Amer. Dietet. Assoc., 11 (1935), No. 2, pp. 119–127, figs. 2*).—Of the materials tested, which included vegetables, nuts, beefsteak and liver, cheese, cream, butter, egg yolk, halibut, and various vegetable oils, only the egg yolk, butter, cream, liver, and fish contained "any substantial amount of vitamin D worthy of mention from a nutritional standpoint."

Leukopenia and anemia in the monkey resulting from vitamin deficiency, P. L. Day, W. C. Langston, and C. F. Shukers (*Jour. Nutr., 9 (1935), No. 5, pp. 637–644*).—Attempts were made to produce cataracts in the eyes of monkeys by feeding a vitamin G-deficient diet similar to that on which cataracts were produced in rats (E. S. R., 72, p. 730).

"After a varying period on the diet, the animals developed a fulminating fatal blood disease characterized by anemia and leukopenia. Ulceration of the gums was a consistent accompaniment of the hypocythemia, and diarrhea was common. There was a progressive decrease in blood cholesterol, but no significant change in the blood sugar level. Blood urea remained normal until the last 2 days of life, at which time the level of this substance became somewhat elevated. There was no retention of creatinine."

The survival periods on the deficient diet ranged from 26 to 81 days, with an average of 56 days. Since a control receiving the deficient diet plus brewery yeast had lived more than 200 days at the time of writing, without showing any symptom of deficiency, it is concluded that the syndrome described was due to a lack of some component of the vitamin B complex. The condition, however, in no way resembled blacktongue or pellagra.

Avitaminosis.—XVII, Influence of high fat-containing diets on vitamin B_1 requirements, R. Suke and K. S. Buchanan (*Soc. Expt. Biol. and Med. Proc., 33 (1935), No. 1, pp. 75, 76*).—In this continuation of the series of papers noted previously (E. S. R., 71, p. 282), evidence is reported that in the nonlactating as well as the lactating rat (E. S. R., 69, p. 618) fat exerts no sparing action for vitamin B_1 even in the presence of an abundance of protein and vitamin G. This is in accord with the recent results of Steenbock and Kemmerer (E. S. R., 72, p. 560) but not with those of Evans, Lepkovsky, and Murphy (E. S. R., 73, p. 135).

The nature of the antipernicious anemia principle in stomach.—I, Method to improve stomach preparations, E. A. GREENSPON (*Jour. Amer. Med. Assoc., 106 (1936), No. 4, pp. 266–271*).—The evidence on which is based the theory of Castle and associates concerning the nature of the gastric deficiency in pernicious anemia (E. S. R., 68, p. 280) is criticized, and original experiments are described which suggest a different interpretation, not involving the extrinsic factor of Castle.

According to the author's theory, pepsin is antagonistic to the antipernicious anemia factor (intrinsic factor) in the stomach. The function of materials such as beef muscle, which, according to Castle, contain the extrinsic factor, is to react with the pepsin, thus preventing the inactivation of the antipernicious anemia factor. In terms of the new theory, the equation proposed by Wilkinson and Klein (E. S. R., 71, p. 140) in explanation of Castle's theory becomes

Normal gastric juice, antipernicious anemia factor + Beef muscle containing protein (B) → Antipernicious anemia factor (A), also bound pepsin.
(A), also free pepsin

The work of Castle and associates and of Sturgis and Isaacs (E. S. R., 62, p 398) is reinterpreted according to the new theory, and a preliminary report is given of a new method for making stomach preparations for the treatment of pernicious anemia by ingestion and injection by removing the antagonistic action of pepsin.

The development of remedies for the treatment of pernicious anemia, W. B. CASTLE (*Amer. Jour. Pharm., 108 (1936), No. 2, pp. 55–61*).—This is a brief review of the development of preparations for the treatment of pernicious anemia since the discovery in 1926 by Minot and Murphy (E. S. R., 56, p. 294) of the beneficial effects of liver feeding. A list of 25 references to the literature is appended.

A comparison of the anemia produced by feeding young rats upon human, cow, and goat milk, H. H. BEARD and T. S. BOGGESS (*Amer. Jour. Physiol., 113 (1935), No. 3, pp. 642–646, figs. 3*).—This paper reports a comparison of the effects of the exclusive feeding of human, cow's, and goat's milk, respectively, to young rats from the time of weaning at 23 days to the age of 11 or 12 weeks.

Growth was best on the human milk and poorest on the goat's milk. Hemoglobin was maintained at about the original level on human milk and decreased to approximately the same extent on cow's milk and goat's milk, with slightly lower values for the goat's milk. Similar differences were shown in the erythrocyte counts on the three types of milk. There were no marked differences between the pathological changes occurring in goat's milk and cow's milk anemia except for a more severe damage to the bone marrow in goat's milk anemia. Hypertrophy of the heart muscle, atrophy of the spleen, and fatty degeneration of the liver were the most consistent gross pathological findings in the anemic rats.

The effect of iron, with and without copper, upon the prevention of goat's milk anemia was also studied. In a 6-week period the average hemoglobin values of 9 rats fed goat's milk, with no supplement, fell from 9.8 to 4.9 mg per 100 cc. In 19 animals fed goat's milk supplemented with 0.25 mg Fe daily, the average hemoglobin values increased from 10.8 to 11.7 mg per 100 cc, and in 20 animals receiving a further supplement of 0.05 mg Cu, the average hemoglobin values increased from 11.5 to 15 mg per 100 cc. These figures indicate that "iron, with and without copper, prevented the onset of the goat's milk anemia", and also that the response to iron and copper was superior to iron alone.

Experimental goat's milk anemia, H. L. ALT (*Soc. Expt. Biol. and Med. Proc., 33 (1935), No. 1, pp. 48–52*).—Exclusive feeding of goat's milk to young rats for a period of 65 days after weaning at 23 days resulted in a gradual increase in erythrocyte counts from an initial level of 6,800,000 to a level of 9,500,000, a decrease in hemoglobin values from an average of 14 g to 8 g per 100 cc, and an initial increase in reticulocytes in 10 days from a level of 5 percent to 13 percent, followed by a decrease and then a second gradual increase to about 10 percent. It is noted that the results are similar quantitatively but slightly less marked than those observed by Farmer and Cory in the same laboratory in testing cow's milk (E. S. R., 69, p. 473).

In a second series of experiments, the method of Elvehjem and Kemmerer (E. S. R., 67, p. 90) was employed in an attempt to obtain a more severe anemia in a shorter period. At weaning at 21 days the erythrocyte counts of the rats averaged from 3,000,000 to 5,000,000 and the hemoglobin content from 7 to 8.5 g per 100 cc. During the following 3 weeks on goat's milk feeding, the erythrocytes increased slightly and the hemoglobin fell to about 4.5–6 g per 100 cc.

The anemic rats responded equally well as far as erythrocytes and hemoglobin were concerned to therapy with iron and copper, the antipernicious anemia liver extract plus iron, and a liver extract containing the hemoglobin-producing factor of Whipple. All three groups received equivalent amounts of copper. The rats receiving both types of liver extract gained more than twice as much in weight as those receiving iron and copper alone.

An analysis of three hundred cases of asthma in children, E. S. O'KEEFE (*New England Jour. Med., 214 (1936), No. 2, pp. 62–65, figs. 2*).—This is an analysis of asthma in 300 children from 1 to 14 yr. of age.

In about 10 percent of the entire number the onset of asthma occurred during the first year, in 12 percent in the second year, and in 66 percent during the first 6 yr. The average age of onset for the entire group was 4.6 yr. A positive family history of allergic disease did not influence the age of onset of asthma or the frequency of multiple sensitization, although complicating allergic diseases appeared to be somewhat more common in the children of allergic than of nonallergic families. In the first year, foods (particularly egg, wheat, milk, and potato) gave the highest percentage of positive skin tests, followed in the second to the ninth year by animal emanations and then by pollens and miscellaneous (orris powder and house dust). In the thirteenth and fourteenth years the percentages of positive tests for all the antigens showed a sudden marked increase. It is suggested that the onset of puberty may in some way have been responsible for the sudden change.

An outbreak of botulism in New Jersey, F. S. CAPRIO (*Jour. Amer. Med. Assoc., 106 (1936), No. 9, pp. 687–689*).—In this outbreak, involving 5 cases with 3 deaths, the incriminating food was home-canned peppers having a peculiar taste. It is noted that there are only 2 other cases on record in medical literature of botulism attributed to home-canned peppers. These cases occurred in California and proved fatal. Of the 3 patients in the present outbreak who were given botulinus antitoxin, 2 survived, the third dying of bronchial pneumonia.

"The control of similar outbreaks of botulism can be brought about only through an accurate recognition of the symptoms and an immediate report of cases. Measures should be taken to have botulinus antitoxin immediately available when needed as a means of offering each patient the maximum hope of recovery. Prevention of botulism should consist in a wide-spread campaign of education relative to proper methods of the home canning of vegetables and fruits."

The effects of a deficiency of iodine and vitamin A on the thyroid gland of the albino rat, H. M. COPLAN and M. M. SAMPSON (*Jour. Nutr., 9 (1935), No. 4, pp. 469–487, pls. 2*).—Conflicting results reported in the literature on the effect of various dietary factors on the thyroid gland in the rat are summarized briefly, with suggestions as to the cause of the differences reported. In the present study every attempt was made to eliminate all factors other than those under consideration.

Thirteen litters comprising 77 rats with extremely low vitamin A reserves were carefully divided at ages of 22–28 days into groups to be kept on an adequate diet and on diets deficient in iodine, vitamin A, and vitamin A and iodine, respectively. Each animal on an experimental diet was paired against a control. Food and water were supplied ad libitum. The animals on the iodine-deficient diet, with their paired controls, were killed at intervals of from 2 to 16 weeks, and those on the diets deficient in vitamin A and both vitamin A and iodine when there was loss of body weight or appearance of symptoms of xerophthalmia, or at definite periods of time.

A deficiency of iodine alone produced an initial hypertrophy of the thyroid gland in both males and females, and this was followed in both sexes by atrophy. A deficiency in vitamin A alone produced definite hypertrophy in the thyroid glands of the female but consistent atrophy in the male. A deficiency of both iodine and vitamin A produced an initial hypertrophy in animals of both sexes, followed by atrophy in the males. In all cases the enlargement of the thyroid gland was more pronounced in the females than in the males.

Multiple specific nutritional deficiency disease in the adult, R. L. HADEN (*Jour. Amer. Med. Assoc., 106 (1936), No. 4, pp. 261–265*).—Several case reports are given in illustration of the multiplicity of the symptoms of deficiency disease as it occurs in human beings. In commenting upon these reports, it is emphasized that "deficiency disease is due to a lack of the specific nutritional factor at the point in the body where it is needed and normally utilized. The actual incorporation of the nutritional factor in a normal way necessitates an adequate supply, adequately absorbed, and adequately utilized, so that every problem in deficiency disease concerns supply, absorption, and utilization."

Useful tables are included on the nutritional factors with a specific function for the adult, the systems involved and lesions observed in deficiency disease in adults, the clinical conditions associated with specific nutritional deficiency, and the factors influencing the supply, absorption, and utilization of specific nutritional elements.

A comparison of the antirachitic potency of cod liver oil and irradiated ergosterol on a curative and preventive basis, W. C. RUSSELL, M. W. TAYLOR, and D. E. WILCOX (*Jour. Nutr., 9 (1935), No. 5, pp. 569–574*).—In this contribution from the New Jersey Experiment Stations, attention is first called to the fact that in comparisons of the relative antirachitic potency of cod-liver oil and irradiated ergosterol preventive tests have customarily been used for chickens and curative tests for rats. The studies reported were undertaken to answer the question as to whether preventive tests of both sources of vitamin D made with the rat would give results in agreement with those of curative tests with rats or of preventive tests with chickens.

In the preventive tests with rats the response to antirachitically equivalent amounts of cod-liver oil and irradiated ergosterol, as determined curatively, was the same, but with chickens the minimum protective dose on a preventive basis was between 2 and 10 curative units per 50 g of ration.

Selectively irradiated ergosterol: Preliminary communication, T. H. RIDER, G. SPERTI, G. P. GOODE, and H. G. CASSIDY (*Jour. Amer. Med. Assoc., 106*

(*1936*), *No. 6, pp. 452–456*).—The extensive literature on the antirachitic activation of ergosterol and food materials by irradiation and on the discrepancies between the values of various antirachitic agents for rats, chicks, and humans is reviewed briefly as evidence that "the ordinary irradiation of ergosterol yields a plurality of products and that the rat assay of such a mixture of products fails correctly to establish their clinical potency." The work of Sperti and associates, demonstrating that ergosterol when acted upon by only the portion of the ultraviolet spectrum of longer wave length is converted into an isomeric product with pronounced antirachitic activity and uncontaminated with degradation products, is described, with the announcement that such a product prepared by license under the Sperti patent is available for clinical use in the form of a solution of the irradiation product in vegetable oil, the potency of which has been adjusted to 10,000 U. S. P. X (revised 1934) units per gram.

Prevention of rickets with a cod liver oil concentrate in milk, M. G. PETERMAN and E. EPSTEIN (*Amer. Jour. Diseases Children, 50 (1935), No. 5, pp. 1152–1158*).—The subjects in this study were 26 white infants from 2½ to 14 mo. of age at the beginning of the study. During the experimental period, which lasted 4 mo. in the case of 6 of the infants and 13½ mo. for the other 20, each infant received from 8 to 17 oz. of a standard evaporated milk (diluted with water according to formula) containing a cod-liver oil concentrate in amounts furnishing from 228 to 485 units of vitamin D (U. S. P., revised 1934) and from 1,142 to 2,428 units of vitamin A (U. S. P., revised 1934). The sole source of vitamin C was canned ripe pineapple juice, which was given in daily amounts of from 1 to 2 oz.

All of the infants made normal gains in weight and length and showed no clinical, chemical, or roentgenographic signs of rickets or scurvy during the period of study. Five infants who at the beginning had some questionable clinical signs of rickets, but with no positive roentgenographic findings, became normal and remained so, with the exception of one whose Ca : P ratio remained low, although no other signs of rickets were apparent.

The authors are of the opinion that the routine addition of cod-liver oil is greatly simplified by its inclusion in milk.

Carotene in prophylactic pediatrics, A. S. SANDLER (*Arch. Ped., 52 (1935), No. 6, pp. 391–406*).—A group of children, from infants to 6 yr. of age, and living under identical conditions in an orphanage, was divided on a basis of past history into a group of 27 with known high resistance to upper respiratory and other types of infection and a second group of 26 with a history of repeated infections and low resistance, poor appetite, and poor weight and height gains. The children in the second group were given 10 drops of carotene in oil daily with their meals from August 1, 1933, until May 1, 1934, during which time observations were made of weight and height gains, blood conditions, and frequency and severity of upper respiratory infections in both groups.

One mo. before the beginning of the carotene administration the hemoglobin content of the children from 3 to 6 yr. old averaged 67 percent for the 13 children selected for carotene treatment and 68 percent for the 13 controls. Three mo. later the corresponding averages were 70.75 and 69.67 percent and 7 mo. later, at the end of the experimental period, 81 and 65 percent, respectively. The red cell counts followed a similar course, and corresponding differences between the carotene and control groups were noted in all cases, indicating that carotene stimulated red cell and hemoglobin regeneration. The average height gains of the same age group were 3.23 in. for the carotene-fed and 2.23 in. for the controls and the weight gains 4.73 and 4.02 lb., respectively.

At the end of the experiment each child old enough to respond intelligently was given the Jeans eye test (E. S. R., 71, p. 566). No cases of night blindness were found, but the average difference in response was somewhat better in the carotene group than the control group. During the experimental period there were no cases of conjunctivitis or sty, otitis media, nasal and sinus infections, diarrhea, or colitis in either group. One case of scarlet fever developed. Among 24 contacts 8, all receiving carotene, showed positive streptococcus cultures. The carotene dosage was increased to 15 drops daily, and after 11 days the positive reactors became negative. Three of the children whose dosage of carotene had been increased because of the scarlet fever exposure developed carotenemia, which promptly cleared up when the carotene was omitted for a week. In the author's opinion carotenemia should be considered as nothing more than storage of excess carotene.

It is concluded that the use of carotene in underweight and malnourished children whose resistance is often below par is fully justified as a pediatric procedure.

TEXTILES AND CLOTHING

The influence of position isomerism in azo dyes upon their fastness to light and washing, M. E. GRIFFITH (*Ohio Sta. Bul. 561 (1936), pp. 91, 92*).—This progress report lists a series of 12 phenyl-azo naphthylamine dyes prepared and analyzed by the chemistry department of the university for an extension of the investigation noted previously (E. S. R., 73, p. 573).

HOME MANAGEMENT AND EQUIPMENT

The economic utilization of electricity in food preparation in Maine rural homes, M. M. MONROE and P. S. GREENE (*Maine Sta. Bul. 380 (1935), pp. 238–243*).—This progress report (E. S. R., 73, p. 574) consists chiefly of the conclusions drawn in the investigation of the characteristics of utensils for electric heating units which definitely affect cooking costs.

MISCELLANEOUS

Report of the director [of the New Haven Station] for the year ending October 31, 1935, W. L. SLATE (*Connecticut [New Haven] Sta. Bul. 381 (1936), pp. 161–202*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Report of the Hawaii Agricultural Experiment Station, 1935, [J. M. WESTGATE ET AL.] (*Hawaii Sta. Rpt. 1935, pp. 28, figs. 6*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Summary report of progress [of Maine Station], 1935, [F. GRIFFEE ET AL.] (*Maine Sta. Bul. 380 (1935), pp. III+159–258, pl. 1, figs. 14*).—Preceded by a tribute to the late Dr. J. M. Bartlett (E. S. R., 73, p. 286), by H. H. Hanson, this bulletin contains data noted for the most part elsewhere in this issue or previously, together with meteorological investigations.

Quadrennial Report of the South Mississippi Branch Experiment Station, J. C. ROBERT and S. R. GREER (*Mississippi Sta. Bul. 310 (1935), pp. 19, figs. 14*).—A summary of investigations made during the years 1932 to 1935, inclusive, and noted for the most part elsewhere in this issue.

Fifty-fourth Annual Report of [Ohio Station], 1935, C. G. WILLIAMS ET AL. (*Ohio Sta. Bul. 561 (1936), pp. 133, figs. 14*).—The experimental work reported not previously referred to is for the most part noted elsewhere in this issue.

NOTES

Illinois University and Station.—A new approach to the solution of poultry mortality problems has been taken by the station in a project which has just been launched in an effort to decrease losses therefrom in the State which run from 10 percent to as high as 50 percent in some cases. In addition to the research phases of the project, it is planned to hold schools of instruction and demonstrations on poultry diseases for interested groups of veterinarians and flock owners throughout the State. The schools of instruction will be developed in cooperation with officers of local veterinary associations, and the demonstrations will be in cooperation with the farm advisers and veterinarians.

L. J. Norton, formerly a member of the department of agricultural economics, will return to the college and station on September 1 as professor of agricultural economics in charge of agricultural marketing and financing. Under his reappointment he will be associated with the research as well as the extension and resident teaching in agricultural marketing and finance.

Maryland University and Station.—Dr. M. A. Jull, in charge of poultry work of the U. S. D. A. Bureau of Animal Industry, has been appointed head of the poultry department.

Minnesota University and Station.—On July 1 Dr. Andrew Boss concluded more than 45 years of continuous service to the institution, retiring as vice director of the station, a position which he had held since 1917. He was succeeded by F. W. Peck, who will also continue as director of extension. A. C. Smith, head of the poultry department since 1912, retired on the same date and was succeeded by Dr. Hubert J. Sloan, associate in poultry work in the Illinois University and Station.

Puerto Rico University.—The offices of the extension service are to be moved from Rio Piedras to Mayaguez. Director A. E. Bowman of the University of Wyoming has succeeded Dr. M. F. Barrus as director of the service.

South Carolina Station.—E. C. Elting, associate dairyman, resigned July 1 to accept a position as associate animal husbandman in the U. S. D. A. Office of Experiment Stations.

Virginia Station.—The new State appropriation for the fiscal year 1937 of $89,260 represents an increase of 5 percent over the previous year. Effective July 1, the Governor has directed that salaries in all State institutions and departments, which had been reduced 10 percent, be restored to the full base rate.

Washington College and Station.—Dr. Ernest C. McCulloch has been appointed associate professor of bacteriology and parasitology in the College of Veterinary Medicine and research veterinarian in the station, effective September 16. H. F. Hollands, instructor in agricultural economics in the University of Minnesota, has been appointed assistant agricultural economist, beginning August 16.

West Virginia University and Station.—Dr. R. J. Garber has resigned as head of the department of agronomy and genetics to become director of the U. S. D. A. Regional Laboratory for Pasture Research at the Pennsylvania College (B. S. R., 75, p. 3).

EXPERIMENT STATION RECORD

VOL. 75 OCTOBER 1936 No. 4

THE AGRICULTURAL EXPERIMENT STATIONS IN 1935

The recent publication by the Office of Experiment Stations of its annual report on the work and expenditures of the agricultural experiment stations extends through the fiscal year ended June 30, 1935, the period for which summarized information is available for this group of institutions. In much the same way as in former years this report deals primarily with the use of $4,388,000 of Federal funds provided by the Hatch, Adams, Purnell, and supplementary acts for the support of these stations in the several States, Alaska, Hawaii, and Puerto Rico. It also, however, gives the customary general survey of the work of these stations as a whole, and discusses questions of their organization, administration, personnel, research facilities, needs, trends, and public service, and reviews the progress made in coordinating their work with that of the U. S. Department of Agriculture.

The total income of the stations for the year from all sources was $15,072,261.84. This was an increase of $883,806.65, or 6.2 percent, from the previous year, though still $2,984,021 below the high-water mark of 1931. The total was approximately the same as for 1928.

The Federal appropriations to the States under the Hatch, Adams, and Purnell Acts were maintained in full, and receipts from sales, fees, and miscellaneous sources were greater by $490,575. For the first time since 1931, the stations' income from State appropriations and allotments showed an increase, although the total gain was only $18,307 over the previous year. Still another source of increased income was $348,961 as a larger balance carried over from the previous year. Most stations reported an increase in State and other supplementary income, the increases ranging from 0.48 to 153.5 percent. Comparatively few stations reported decreases, and these, ranging from 0.46 to 14.34 percent, were for the most part nominal.

Research facilities continued to be fairly well maintained, but additions to permanent improvements were largely of a minor nature. For the year the stations reported expenditures of $1,062,357 for buildings and equipment, including the purchase of books and journals, scientific apparatus, farm implements and machinery, and livestock. In spite of the cooperation of emergency and relief agencies and donations of funds, lands, and buildings by a number of com-

mercial organizations, the funds available for permanent improvements were nearly one-third less than in 1934 and the smallest recorded since 1921.

Shrinkages during the past few years in publication funds were replaced by an increase from $246,696 to $253,926, and the published output was somewhat enlarged. In the regular series the number of publications was 864, as compared with 842. There were also 1,778 articles reporting or based on station work contributed to 69 outside scientific or technical journals, as compared with 1,373 articles the previous year. Thirty of the stations contributed to or collaborated in 69 articles published in the *Journal of Agricultural Research*, a decrease of 21 articles from the previous year.

The projects and programs of the stations included research into almost every phase of farming and rural life, but there was evidence of increasing emphasis on efficient and remunerative production and on the economic and social aspects. About 7,000 projects were active, a large proportion of which dealt with the more urgent rural problems, especially those concerned with recovery and adjustment measures. The number of individual projects supported by Purnell and Adams funds increased considerably, and this is regarded as probably an indication of the attempts made by the stations to relate their research programs to the emergency. Concerning this tendency, the report points out that since these funds were stationary in amount, "the increased number obviously reduces the support to individual studies and, from that standpoint, is undesirable. However, the emergency activities required immediate attention and, in many cases, provided for additional funds and cooperative study of which it was necessary to take advantage without undue delay."

Notable progress during the year is seen in the organization and extension of coordinated and cooperative research—national, regional, and local. The Office of Experiment Stations examined and recorded during the year 798 new or revised cooperative agreements between bureaus of the Department and the experiment stations, representing 734 major research undertakings. All of the 50 State stations and all but 1 of the research bureaus of the Department had formal cooperative agreements of some kind, besides a large number of informal cooperative activities. Numerous cooperative undertakings organized on an emergency basis as parts of the national recovery program were again participated in by practically all the stations and Department bureaus. The stations were also active in cooperation with each other, with State agencies, and with local organizations.

The number of cooperative studies per station ranged from 1 to 43. Their subjects covered the entire field of agricultural and rural life problems. Increasing emphasis was placed on soil conservation and

use, and especially on adjustments in farming by regions and type-of-farming areas from the standpoint of agricultural adjustment in general.

Among the major enterprises was the participation by the stations in each of the 48 States in a coordinated attempt to assemble in cooperation with the Bureau of Agricultural Economics reliable information on a Nation-wide basis urgently needed as a guide for rational adjustments in farming by regions and types-of-farming areas. A second year of a coordinated study of rural relief and its organization, carried out under the auspices of the Federal Emergency Relief Administration, was completed, with about 30 of the stations participating. A cooperative regional study of fertilizers and fertilizer practices, in which 7 State stations and the Tennessee Valley Authority took part, was carried on, and subsequently similar investigations were undertaken by the same group on the control of soil erosion and run-off water losses and soil mapping and agricultural planning in relation to land use and land management adjustment. Other examples of coordinated effort included the soil erosion, cotton, pasture improvement, soil resources survey, and other regional and national programs, which were continued, expanded, and strengthened.

The report makes clear that the year brought its difficulties, but that on the whole it was a period of distinct gain. The downward trend in the stations' revenues and resources as derived from non-Federal sources seemed to have been definitely arrested, and the passage on June 29, 1935, of the Bankhead-Jones Act brought assurances of a considerably enlarged Federal support and of an increased coordination of effort. For these and other reasons, the general outlook for future efficient service was in most respects much more encouraging than for several years.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical and bacteriological investigations by the Massachusetts Station] (*Massachusetts Sta. Bul. 327 (1936), pp. 20–22, 29, 60, 61*).—Among the items reported are the micro-organisms present in dried fruits and vegetables, by J. A. Clague and J. E. Fuller; media employed in, or suggested for, the bacteriological analysis of water, by Fuller and E. D. Kimball; detection and significance of *Escherichia coli* in commercial fish and fillets, by F. P. Griffiths, Fuller, and R. L. France; acid production by *E. coli* and *Aerobacter aerogenes*, by A. V. Syrocki, Fuller, and France; the influence of bile and bile salts on *A. (Bacterium) aerogenes*, by Fuller; the methyl red reaction, the Eijkman test, and the dye tolerance of the *coli-aerogenes* group, all by France; a study of the action of the *coli-aerogenes* group on *Erythrosin*, by France and Fuller; chemical study of cranberries, by F. W. Morse; the carbohydrates of Kentucky bluegrass, by E. Bennett; cider making with New England apples, by Clague, C. R. Fellers, and W. A. Maclinn; and the storage and utilization of cranberries and the effect of cranberries, apples, and blueberries on intestinal putrefaction, by Fellers, Clague, P. D. Isham, and W. B. Esselen, Jr.

[Chemical investigations by the North Dakota Station] (*North Dakota Sta. Bul. 286 (1935), pp. 40–42, figs. 2*).—Data are reported as to physical and chemical properties of starch from different types of wheat; factors influencing the protein content of hard red spring wheat; and a study of the fatty constituents of wheat and wheat products and their relation to the technical value of flour and oher mill products.

The synthesis of crystalline cystinyldiglycine and benzylcysteinylglycine and their isolation from glutathione, H. S. Loring and V. du Vigneaud (*Jour. Biol. Chem., 111 (1935), No. 2, pp. 385–392, fig. 1*).—The authors of this contribution from the George Washington University describe a method for the preparation of cystinyldiglycine in crystalline form from dicarbobenzoxycystinyldiglycine by treatment with sodium in liquid ammonia.

"It has been shown that the dipeptide obtained by Kendall, Mason, and McKenzie [E. S. R., 65, p. 610] by the partial hydrolysis of glutathione can be converted to crystalline cystinyldiglycine on oxidation with air, thus affording synthetic proof of the identity of this peptide. The reduced peptide, cysteinylglycine, obtained from glutathione yielded the same crystalline S-benzyl derivative as that prepared from synthetic cystinyldiglycine."

Preparation and properties of mono-, di-, and tricalcium phosphates, H. W. E. Larson (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 6, pp. 401–406, fig. 1*).—In an investigation carried out at the Wisconsin Experiment Station crystalline monocalcium phosphate monohydrate was prepared by evaporating at from 33° to 40° C. a water solution of phosphoric acid and calcium hydroxide having a P_2O_5 to CaO ratio of 5:1. The values of the refractive indices N_p, N_m, and N_g were found to be 1.5292, 1.5176, and 1.4932, respectively. It became anhydrous at 109°, became a mixture of pyrophosphate and

metaphosphate on heating for a long period at 203°, was transformed into metaphosphate at 325°, and lost weight equivalent to 6 molecules of water at 950°. The solubility at 25° was 10 and 14 g per liter in water and carbon dioxide-saturated water respectively, when the quantity of the salt added was limited to that which dissolved completely. When more of the salt than would dissolve was added, hydrolysis was evident. The pH of a water solution containing 10 g of the salt per liter was 3.62.

Dicalcium phosphate tetrahydrate was prepared by crystallization of the salt at 30° from a 25-percent acetic acid solution to which anhydrous dicalcium phosphate had been added. The refractive indices N_g, N_m, and N_p were found to be 1.5576, 1.5457, and 1.5392, respectively. Heating the salt for 5-hr. periods at 108°, 150°, and from 150° to 185° caused a loss equivalent to 1 molecule, 2 molecules, and to from 3 to 4 molecules of water, respectively. The salt was transformed into pyrophosphate at from 950° to 970°. The solubility in water at 25° was in the range of from 0.16 to 0.196 g per liter, and in carbon dioxide-saturated water, from 0.62 to 0.82 g per liter. The pH values of water solutions containing 0.196 and 0.160 g of salt per liter were 6.00 and 6.55, respectively.

Tricalcium phosphate monohydrate was prepared by the slow addition of calcium chloride solution to a constantly agitated alkaline solution of disodium phosphate, maintained at from 65° to 70°. An X-ray diffraction pattern indicated the product to be crystalline, but the crystals were too small for petrographic study. The salt was stable at 100°. When heated at 325° for 24 hr. and at from 950° to 970° for 5 hr., it lost weight equivalent to 0.6 and 1 molecule of water, respectively. The solubility in water at 25° varied with the ratio of salt to water from less than 0.005 to more than 0.03 g per liter, and in carbon dioxide-saturated water from 0.058 to 0.23 g per liter. The pH values of water solutions containing 0.0132 and 0.0307 g of salt per liter were 6.22 and 6.41, respectively.

Some effects of potassium upon the amounts of protein and amino forms of nitrogen, sugars, and enzyme activity of sugar cane, C. E. HARTT (*Plant Physiol., 9 (1934), No. 3, pp. 453–490, fig. 1*).—This paper, from the Hawaiian Sugar Planters' Experiment Station, reports the results of determinations of the enzymes invertase, amylase, and ereptase, of total and amino nitrogen, reducing sugars, and sucrose; and certain physicochemical characteristics of the juices expressed from the leaves, stems, and roots of sugarcane plants supplied with varying quantities of potassium.

Very little difference was found between the H-ion concentration, titratable acidity, and buffer systems of the expressed juices of the controls and those of the plants deficient in potassium.

Two months after starting the plants in the nutrient solutions there was a higher percentage of amino nitrogen and a lower percentage of protein nitrogen in the blades and the stems of the plants starved for potassium than in the controls. Seven months after starting the plants in the nutrient solutions higher percentages of amino, protein, and total nitrogen were found in the blades of the potassium-deficient plants, while in the stems the opposite relationship was found to occur. "The curtailment in the synthesis of proteins was found to occur after the formation of amino acids rather than before, indicating that in these plants the reduction of nitrates proceeded as usual."

The blades of the plants deficient in potassium contained higher percentages of reducing sugars and lower percentages of sucrose than the controls. The percentages of total sugars in the blades remained about the same. The relationships between the sugars in the stems depended upon the degree of

potassium deficiency. The stems of the plants partially starved for potassium contained higher percentages of reducing sugars and lower percentages of sucrose than the controls, while the stems of the plants more completely deprived of potassium were very low in reducing sugars as well as sucrose. There was a positive correlation between the quantity of potassium supplied and the total sugar stored. No evidence of the accumulation of carbohydrates in the plants deficient in potassium was obtained.

The optimum reaction for the activity of invertase in the blades and the stems was found to be around pH 4.4. The invertase activity of the plants deficient in potassium was weaker than that of the controls, in both blades and stems, when tested unbuffered. The invertase activity in the stems was affected more severely by potassium deficiency than was that in the blades. When tested at the optimum reaction, the invertase activity was equal in all blades. The activity in the stems was not equal at the optimum reaction, although the difference between the extremes was less than when the activity was tested in unbuffered solutions. "Because the invertase activity in all the blades was equalized at the optimum reaction, it seemed that potassium is not essential for the formation of invertase." The experiments recorded "offer indirect evidence that sucrose in the sugarcane plant is synthesized by invertase", and that the enzyme is activated by potassium compound.

The optimum reaction for the amylase of blades was found to be pH 5.9. The amylase of stems seemed not to be much affected by the H-ion concentration. Amylase activity was greater in the plants deficient in potassium than in the controls, in both blades and stems. The effects of potassium, phosphorus, calcium, magnesium, dialysis, and sugars upon the activity of amylase were investigated. "Several possible causes of the increased activity of amylase in the plants deficient in potassium are examined, and the conclusion is suggested that potassium deficiency removes the protective action of potassium from amylase, thus allowing the enzyme to be activated more readily by phosphorus, which is present in potassium-deficient plants in greater amounts than in the plants supplied with an adequate amount of potash. The increased activity of amylase in the plants starved for potash is an undesirable characteristic, because under the conditions of condensation in the stems it might lead to the formation of starch. This is undesirable both because of the utilization of dextrose which should go to the formation of sucrose and because the presence of dextrins and certain other higher carbohydrates in the juices leads to difficulties in the process of clarification."

The optimum reaction for the activity of ereptase in the blades and roots was pH 4.9, and in stems, pH 5.9. Potassium seemed to have no effect upon the activity of ereptase except in the roots, in which the greater activity occurred in the plants deficient in potassium. No peptase activity was detected.

"It seems likely that potassium affects either directly or indirectly most of the activities of plants, and it is at present impossible to assign one particular process as the special role of potassium in the physiology of plants."

Stirring air within desiccators, F. J. ZINK (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 6, pp. 442, 443, figs. 3*).—In the device here reported from the Kansas Experiment Station, 2.5-in. disks of tin plate were cut to form fan blades, lightly punched at the center, and mounted on pivots near the inside walls of the desiccators, and the latter were ranged about a revolving wooden disk, 2.5 ft. in diameter, carrying "magneto" magnets at its edge. The revolving disk, motor, and reducing gears (48:1) were part of a window display unit. The fans in 15 desiccators could be operated at one time by this means, and fan speeds up to 200 r. p. m. were attained.

A simple automatic cut-off for electric stills, M. R. ASWATHNARAYANA RAO and BASELR SANJIVA RAO (*Indus. and Engin. Chem., Analyt. Ed.*, 7 (*1935*), *No. 6, p. 377, fig. 1*).—A form of mercury manometer in which the pressure of the water supply maintains the contact of the mercury with two points in series with the relay of the heating circuit is described. The free arm of the U-tube consists of two tubes in parallel. Failure of the water pressure permits the mercury to drop away from both contacts at once, causing a double break in the control circuit.

A convenient absorption and titration flask for carbon dioxide determination, R. GARDNER (*Indus. and Engin. Chem., Analyt. Ed.*, 7 (*1935*), *No. 6, pp. 437, 438, figs. 3*).—It is reported in a contribution from the Colorado Experiment Station that "a modified form of the absorption unit . . . which has been found very useful for a variety of carbon dioxide determinations consists of a 250-cc Erlenmeyer flask with a side arm drawn down at the end for tube connection and a fritted glass disk sealed in the tube at the point where it begins to taper." The flask was made by blowing a hole in the end of a test tube, sealing on a small piece of tubing, and fusing in a porous disk. The tube was then sealed into the side of the flask. The disk was made of 100- to 200-mesh glass.

Quantitative analysis of solutions by spectrographic means, O. S. DUFFENDACK, F. H. WILEY, and J. S. OWENS (*Indus. and Engin. Chem., Analyt. Ed.*, 7 (*1935*), *No. 6, pp. 410–413, figs. 4*).—In this method for determining the amounts of metallic elements in a solution of their salts, an uncondensed spark in air between a suitably chosen solid electrode and the solution under analysis is photographed, and, from measurements on the relative intensities of chosen spectral lines, the analysis is made by reference to previously determined working curves. An internal standard is employed. Two methods for correcting for the influence of the presence, in varying concentrations, of one element on the intensity of the spectral lines of another are described. The method has been applied in the determination of sodium, potassium, magnesium, and calcium in solutions of mixtures of their salts in concentrations varying over the range of their occurrence in human urine.

"The accuracy of analysis of an unknown is, in general, such as to give an error of about 2 percent of the amount of the test element present."

Determination of manganese and magnesium in soils and silicate rocks, L. A. DEAN and E. TRUOG (*Indus. and Engin. Chem., Analyt. Ed.*, 7 (*1935*), *No. 6, pp. 383–385*).—An investigation carried out at the Wisconsin Experiment Station has shown that the precipitation of manganese by oxidation with bromine or persulfate in the regular course of analysis of rocks and soils is not satisfactory because of the incompleteness of precipitation of the manganese, and, at times, contamination of the manganese precipitate with magnesium and the magnesium precipitate with manganese. To overcome these difficulties, it is suggested that the manganese be precipitated with the magnesium as the phospohate. The phosphates of manganese and magnesium are then to be weighed or titrated together, after which the manganese present is to be determined by means of the bismuthate method and the magnesium is determined by difference. In a number of tests this procedure has given satisfactory results.

Colorimetric determination of manganese in the presence of titanium, G. J. HOUGH (*Indus. and Engin. Chem., Analyt. Ed.*, 7 (*1935*), *No, 6, pp. 408, 409*).—In the absence of quantities of titanium great enough to produce interfering concentrations (1 percent or more) in the solution in which the color is developed, the following method is successful at the Bureau of Chemistry and Soils, U. S. D. A.:

"One g of the soil is ignited in a small platinum dish to destroy organic matter, and is then digested on the hot plate with 25 cc of hydrofluoric acid and 5 cc of sulfuric acid until white fumes appear. It is cooled, diluted with water, warmed gently until all salts are in solution, and then filtered through a close filter to insure a perfectly clear solution. The filtrate is transferred to a 100-cc volumetric flask, 1 cc of 0.5-percent silver nitrate solution is added, and then 1 g of ammonium persulfate. The flask is put on the steam bath for 20 to 30 min. until the color is fully developed. It is then cooled, made up to volume, and compared with a suitable standard in a colorimeter.

"Another convenient way to prepare the sample is to fuse, after ignition, with about 10 g of potassium pyrosulfate and 1 g of sodium fluoride; heat to fumes for some time, cool, extract with hot water, boil, filter, and treat as above with persulfate. The standard manganese solution is best prepared from C. P. manganese sulfate, and for soils and rocks should have a value of about 0.0002 g MnO per cubic centimeter."

Attention is directed, however, to the fact that "if titanium oxide is present in the solution in amounts exceeding 1 percent, the persulfate method is useless, as no color is developed unless excessive amounts of reagents are used, and even then one cannot be certain that the full color has developed. This was observed . . . during the analysis of some soils that were unusually high in titanium (2 to 12 percent). In making the determination of manganese by the persulfate method no color developed at first, although there was good reason for believing that the samples contained some manganese. When more reagents were added, to an excess of four or five times the usual amount, the color finally appeared."

Contrary to the statements said to be found in some textbooks, it was shown that titanium cannot be volatilized by evaporation with hydrofluoric acid to an extent sufficient to prevent interference by the titanium in the persulfate oxidation of the manganese.

"It is recommended that potassium periodate be used as the oxidizing agent in the presence of much titanium. Sodium bismuthate can also be used successfully, as there is no interference with the development of the manganese color."

Determination of selenium in organic matter, K. T. WILLIAMS and H. W. LAKIN (*Indus. and Engin. Chem., Analyt. Ed.*, 7 (*1935*), *No. 6, pp. 409, 410*).—In a further investigation carried out at the Bureau of Chemistry and Soils, U. S. D. A., the authors have found it possible to reduce the time required in the method of Robinson, Dudley, Williams, and Byers (E. S. R., 74, p. 299) in the preparation of samples of as much as 10 g of vegetable matter from a period of 6 or 8 hr. necessary for the Kjeldahl digestion to one of about 2 hr. by following a procedure which is thus described:

"To prepare a sample of air-dry vegetation it is first ground to pass a 2-mm mesh sieve, then mixed and quartered. A weighed sample, usually 10 g, is stirred into a mixture of 50 cc of concentrated sulfuric acid and 100 cc of nitric acid in a 600-cc Pyrex beaker. The mixture is stirred with a thermometer until it becomes homogeneous, after the first few minutes with gentle heating, without allowing the temperature to rise above 100° C. After all frothing has ceased, the temperature of the mixture is raised to a maximum of 120° until all evolution of nitrogen peroxide has ceased. The end of the operation is marked also by an incipient carbonization of the mixture, although longer heating at or below 120° does little harm. After the mixture is cooled it is transferred to an all-glass distilling flask, 100 cc of hydrobromic acid and 1 cc of bromine are added, and 75 cc of distillate are collected. Care

is taken that the first portion of the distillate contains a small excess of bromine."

The subsequent procedure was not modified, except that it was found necessary to carry digestion to the point of removing all nitric acid (to avoid the presence in the distillate of nitroxyl bromide) "which is not decolorized by sulfur dioxide and requires excessive quantities of hydroxylamine hydrochloride"; and to avoid carrying the digestion so far as to cause evolution of sulfur trioxide fumes, since such excessive heating brings about a loss of some selenium.

The determination of small quantities of selenium in sulfur, G. G. MARVIN and W. C. SCHUMB (*Indus. and Engin. Chem., Analyt. Ed.*, 7 (*1935*), *No. 6, pp. 423–425, fig. 1*).—This article reports upon a method for the determination of selenium in sulfur over the range from 0.1 to 0.001 percent. "Smaller percentages could no doubt be determined by the use of a larger sample for analysis, but the range below 0.001 percent was not investigated in the present work."

In the proposed method, the sample is burned in a 45-mm Pyrex glass tube 60 cm (2 ft.) long; the selenium is caught in a suitable solid filtering medium, and is then converted into selenium dioxide. This is titrated by the iodometric method: $SeO_2+4HI \rightarrow Se+2H_2O+2I_2$.

Quantities of arsenic and tellurium equivalent to that of the selenium were found to cause no interference. The apparatus required is simple in construction, the number and quantity of reagents used are small, and the total time required is only a few hours. "The reproducibility of results is quite satisfactory, if the usual precautions of analysis are observed."

Spectrographic microdetermination of zinc.—Preliminary note, L. H. ROGERS (*Indus. and Engin. Chem., Analyt. Ed.*, 7 (*1935*), *No. 6, pp. 421, 422, fig. 1*).—Preliminary experiments on a quantitative spectrographic method for determining zinc in plant material when present in concentrations between 0.1 and 0.005 percent, employing tellurium as an internal standard, are reported from the Florida Experiment Station. Iron was found to interfere with the determination when present in concentrations of about 1 percent. A procedure for making allowance for this interference is suggested.

"The maximum deviation of the analyses from the mean in most cases is less than 1 part in 5."

Accuracy of the determination of lead and arsenic on apples, D. E. H. FREAR and W. S. HODGKISS (*Jour. Agr. Res. [U. S.]*, *52* (*1936*), *No. 8, pp. 639–644*).—A statistical study at the Pennsylvania Experiment Station of the accuracy of the photoelectric method for the chemical determination of lead on apples as spray residue in comparison with the accuracy of the Gutzeit method in determination of the arsenic is reported upon. When a series of 50 samples each containing 0.4000 mg of lead were analyzed the probable error was ±0.0028 mg, and when 164 samples of apples were analyzed for lead and arsenic the average deviation from the mean was 7.4 percent of the mean in the case of arsenic and 6.8 percent of the mean in the case of lead, indicating that the method for the latter element was slightly more precise than Gutzeit arsenic determination.

A new method for the determination of minute amounts of lead in urine, J. R. ROSS and C. C. LUCAS (*Jour. Biol. Chem., 111* (*1935*), *No. 2, pp. 285–297. fig. 1*).—The authors utilize the diphenylthiocarbazone reaction in a microcolorimetric method for the determination of small amounts of lead in urine, noting that "the sensitivity of the reagent dithizone for the detection of lead (0.001 mg) compares very favorably with that claimed for the spectrographic method

and the reagent has the advantage that amounts greater than 0.001 mg may be quantitatively estimated."

"The method is applicable for use in a clinical laboratory, since the time required for a determination is reduced to 3 hr."

Semi-micro-Kjeldahl determination of nitro and azo nitrogen, R. A. HARTE (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 6, pp. 432, 433*).—A sample containing from 2 to 5 mg of nitrogen is digested in the presence of 0.3 g of pure dextrose, from 1 to 1.5 g of potassium sulfate, 0.02 g of copper sulfate, "and a few bits of well washed alundum (grain size 14, boiled out to 5 to 6 times with distilled water until the washings showed no change of pH)", and with 4 cc of concentrated sulfuric acid. Conditions of the digestion are specified. "As soon as the digestion mixture has become homogeneous, 1 drop of selenium oxychloride is added. Heating is continued until the solution is clear and for 15 to 20 min. thereafter. The time of digestion varies from 35 to 45 min." The manner in which the distillation is carried out is also detailed.

Determination of protein nitrogen, accelerating the Kjeldahl-Gunning-Arnold digestion by addition of phosphates, H. W. GLEBITZ and J. L. ST. JOHN (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 6, pp. 380–383*).—The authors of this contribution from the Washington Experiment Station report experiments, in the most satisfactory of which 10 g of anhydrous dipotassium phosphate or 12 g of dipotassium phosphate trihydrate, or an equivalent quantity of phosphorus pentoxide plus potassium hydroxide, were substituted for $^{10}/_{16}$ of the sodium or potassium sulfate used in the digestion of samples for protein nitrogen determinations.

"Two-g samples of feeds and wheat products were digested in 25 min. or less over the Bunsen flames available and in 9 min. on a preheated 700-w electric plate. Samples of dried blood, fish meal, soybean meal, and dried skim milk were digested in 15 min. over grid burners. The results obtained compared well with analysis by the official Kjeldahl-Gunning-Arnold method."

Errors of routine analysis for percentage of sucrose and apparent purity coefficient with sugar beets taken from field experiments, F. R. IMMER and E. L. LECLERG (*Jour. Agr. Res. [U. S.], 52 (1936), No. 7, pp. 505–515*).—In a study by the Minnesota Experiment Station, cooperating with the U. S. D. A. Bureau of Plant Industry, comparative analyses in each of 2 yr. showed that the laboratory errors between 10-, 20-, and 30-beet samples did not vary significantly for either sucrose or purity coefficient. The laboratory error was a proportionately greater part of the plat error for purity coefficient than for percentage of sucrose. Increasing the number of samples analyzed per plat would reduce the plat variance more rapidly than increasing the number of analyses per sample. Approximately one-fourth of the variability in purity coefficient, as measured by the differences between duplicate samples, could be attributed to its inherent association with percentage of sucrose.

[Methods of improving yeast-making process] (*Wisconsin Sta. Bul. 435 (1936), pp. 82, 83, fig. 1*).—Notes are given on investigations by E. C. Saudek and D. Colingsworth.

Compilation relating to uses and products made of corn, C. L. PHILLIPS and E. G. BOERNER (*U. S. Dept. Agr., Bur. Agr. Econ., Grain Invest. [Pub.] 31 (1936), Sup. 1, pp. [1]+22–36; 31 (1929), Sup. 2, pp. 4; 31 (1931), Sup. 3, pp. [2]+17; 31 (1935), Sup. 4, pp. [1]+28, figs. 2*).—The four supplements to this compilation (E. S. R., 53, p. 614), here noted, present abstracts, short quotations, and references, illustrative of the expanding industrial utilization of corn.

AGRICULTURAL METEOROLOGY

An evaporation survey of Ohio, J. D. WILSON and J. R. SAVAGE (*Ohio Sta. Bul. 564 (1936), pp. 53, figs. 6*).—The original purpose of the survey here reported "was to determine some of the relationships existing between evaporation rates and the distribution and prevalence of certain insects, such as the European corn borer (*Pyrausta nubilalis* Hubn.) and the Mexican bean beetle (*Epilachna corrupta* Muls.). It was later completed as a general study of some of the ecological conditions existent in Ohio."

The average evaporation total for the 4-yr. period 1928 to 1931, inclusive, varied only from 2,600 to 3,000 cc for the 17 stations which were maintained during all of these years. The average rate of water loss for these stations was 2,500, 3,000, 4,800, and 3,300 cc, respectively, for 1928, 1929, 1930, and 1931. Evaporation during the summer period was generally highest in regions having low yearly rainfall and lowest in those with higher rainfall. Evaporation was found to be highest along Lake Erie, lowest along the Ohio River, and intermediate over the remainder of the State. This was especially due to high velocity of wind along the lake, which was twice as great as in the river valley. Comparison of evaporation rates at sites representative of different forest types showed very little variation.

"A comparison of crop yields and data relative to evaporation-rainfall ratios indicated that yields could be predicted or ranked with but little more accuracy than could be done by using rainfall data alone. However, unpublished data have indicated that the use of the ratio values is more reliable than rainfall alone in predicting yields for restricted areas, such as a single farm. Evaporation records taken at sites having different exposures, such as open fields, pastured woodlots, and dense woods, indicate that the rate may be expected to be about one-half as great in pastured woodlots as in exposed situations and that the former will be again halved in rather dense stands of trees."

Precipitation trends, E. L. ARMSTRONG and W. GARDNER (*Utah Acad. Sci., Arts, and Letters, Proc., 12 (1934–35), p. 173*).—It is stated that "results obtained indicate that during the last 45 yr. in the humid section (which is considered to be that area east of the hundredth meridian line), as well as in the intermountain section, precipitation shows a slight upward trend. This increase is so slight, however, that little significance can be attached to it. In the Pacific coast region the trend has been decidedly downward, the slope being —0.313. During the period the ordinate decreased 14 in."

Studies of rainfall distribution in Puerto Rico [and the Virgin Islands], A. LEE and F. HARTWELL (*[San Juan]: Puerto Rico Emergency Relief Admin., 1935. pp. [1]+3, pls. 40*).—This is a series of graphs (blueprints) compiled by the Puerto Rico Experiment Station from records by the U. S. D. A. Weather Bureau, showing average rainfall in 14-day periods during 20 or more years at Weather Bureau stations in Puerto Rico and the Virgin Islands.

The floods and droughts of the lower Yangtze Valley and their predictions, K. Y. CHENG (*Jour. Geogr. Soc. China, 2 (1935), No. 3, p. 4*).—A comparison is made of long-range forecasting of floods and droughts in the lower Yangtze Valley by means of periodicities and correlation coefficients. The method of using periodicities was found not suitable for practical long-range forecasting because the periods may change phase without warning. It was found that certain correlation coefficients were useful in forecasting floods and droughts of the valley.

The dependence of terrestrial temperatures on the variations of the sun's radiation, C. G. ABBOT (*Smithsn. Misc. Collect., 95 (1936), No. 12, pp. 15,*

figs. 7).—This article presents evidence to show that variation of the sun's radiation sensibly affects the course of temperature in terrestrial weather, and that the march of terrestrial temperature supports the view that the sun is a variable star, as claimed by H. H. Clayton.[1]

Factors affecting ultraviolet solar-radiation intensities, W. W. COBLENTZ and R. STAIR (*Jour. Res. Natl. Bur. Standards [U. S.], 15 (1935), No. 2, pp. 123–150, pls. 2, figs. 6).*—This contribution from the Bureau of Standards, U. S. Department of Commerce, reports measurements of the spectral quality of short wave length ultraviolet solar radiation at different stations as affected by the altitude of the sun, by the geographical latitude and the altitude of the observing station, and by different atmospheric conditions. The measurements were made with a newly developed radiometer, which is described and illustrated. The stations at which the readings were taken were Washington, D. C, with an elevation of 350 ft., Flagstaff, Ariz., with an elevation of 7,300 ft., and the nearby San Francisco peaks with an elevation of 10,500 ft., and at San Juan, P. R., elevation about 75 ft. Corresponding latitudes were 38°56′ N., 35°12′ N., and 18°28′ N.

Climatological data for the United States by Sections, [1935] (*U. S Dept. Agr., Weather Bur. Climat. Data, 22 (1935), No. 13, pp. [2½], pls. 3, figs. 23).*—Summaries are given of climatological data for each month of 1935 and for the year as a whole for each State.

Monthly Weather Review, [January–February 1936] (*U. S. Mo. Weather Rev., 64 (1936), Nos. 1, pp. 36, pls. 11, figs. 12; 2, pp. 37–67, pls. 12, figs. 6).*—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 1.—Determinations of Atmospheric Turbidity and Water Vapor Content, by H. H. Kimball (pp. 1–5); Measurement of Schott Glass Filter Temperatures, by R. F. Baker (pp. 5, 6); a Brief List of Works on Meteorology, compiled by C. F. Talman (pp. 7, 8); Subsidence in Maritime Air Over the Columbia and Snake River Basins, by A. B. Carpenter (pp. 9–13); The Diurnal Variation in Ceiling Height Beneath Stratus Clouds, by E. M. Vernon (pp. 14–16); and Ground Temperatures Compared to Roof Temperatures, by B. R. Laskowski (p. 17).

No. 2.—Pressure Distribution in Relation to Thunderstorm Occurrence on Oregon and Washington National Forests, by R. A. Ward (pp. 37–45); and Effect of Insolation on Sounding-Balloon Meteorograph Temperature Elements, by C. M. Lennahan (p. 45).

SOILS—FERTILIZERS

[Soil and fertilizer research by the Massachusetts Station] (*Massachusetts Sta. Bul. 327 (1936), pp. 11, 12, 27, 29).*—Work is noted regarding the absorption by food plants of chemical elements important in human nutrition, by W. S. Eisenmenger and E. B. Holland; magnesium requirements of plants, by Eisenmenger and M. E. Snell; experimentation with artificial manure, by Eisenmenger and K. Kucinski; the water-holding capacity of mixed soils, by L. H. Jones; and nitrogen fixation in the presence of or as a result of the growth of legumes v. nonlegumes, by F. W. Morse.

[Soil investigations of the North Dakota Station] (*North Dakota Sta. Bul. 286 (1935), pp. 12, 13, 27).*—The soil survey and land classification are

[1] Smithsn. Misc. Collect., 71 (1920), No. 3, pp. VI+53, pls. 5, figs. 18.

reported upon by K. Ableiter et al.; means for ascertaining phosphate deficiency in calcareous soils, by J. E. Chapman and H. L. Walster; and a phylogenetic study of the actinomycetes of the soil, by C. I. Nelson, G. Lindsey, and I. Brayton.

[Soil and fertilizer investigations of the Wisconsin Station] (*Wisconsin Sta. Bul. 435 (1936), pp. 51, 53–55, 88–92, 93–99, figs. 5*).—Two biological measures of soil fertility—the one a method using *A[spergillus] fuscus*, the other an improvement in the technic of the use of *Cunninghamella* sp.—are mentioned. Other items deal with the efficiency of free and combined nitrogen for soybeans, by P. W. Wilson et al.; a simplified test for manganese and magnesium, by L. A. Dean and E. Truog; simple soils tests improved, by Truog; soil conditions required for successful forest nursery operation, by S. A. Wilde; nitrogen fertilization of rye on sandy soils and at the Coddington Substation on peat soils, both by A. R. Albert; and fertilizer treatments for cranberries and canning peas, both by F. L. Musbach.

Land classification, C. F. Marbut (*J. Internatl., Cong. Soil Sci., Oxford, Eng., 1935. Trans., vol. 1, pp. 290–292*).—The author of this contribution from the U. S. D. A. Bureau of Chemistry and Soils briefly discusses the general bases of land classification, noting, in part, with respect to the system adopted for this country, that "it was decided to differentiate the lands of the United States into 10 grades or degrees of productivity, designating the land of highest productivity as grade 1 and the lowest grade 10. It was considered necessary also, in order to maintain uniform relationships of grades over the whole area of the country, to rate all lands according to inherent productive capacity and, therefore, on their productivity when used without fertilizers or other soil amendments other than the return to the land in the form of manures of the waste left from feeding the crops grown, and the return also of crop residues by means of good, well-recognized agricultural methods. It was also realized that a uniformity of production throughout the country or a uniform rating on the basis of inherent productivity can be maintained only when land is rated throughout the whole country for the production of the same or very similar crops or groups of crops. . . . It was decided, therefore, to rate all lands of the United States on the basis of their inherent, natural productivity for the grains and the grasses. The particular grain in any given region, on the basis of which the rating was established, is the grain most widely grown in the region. For the Cotton and Tobacco Belts the rating on the basis just described was maintained, but a secondary rating was given, based on the inherent productivity of the land for cotton and tobacco, respectively.

"A rating of this kind must be based on land characteristics and not on statistics. A productivity rating also within any given adaptability region must be based on soil almost exclusively, relief being concerned primarily with accessibility of the land and with the practicability of agricultural use rather than with productivity."

A system of land classification, C. E. Kellogg (*J. Internatl. Cong. Soil Sci., Oxford, Eng., 1935. Trans., vol. 1, pp. 283–286*).—The author of this contribution from the U. S. Department of Agriculture classifies lands according to physical features, natural productivity, use group, and, within the individual use group, according to the external factors affecting practical productivity value. "Such considerations include accessibility to markets, nature of the existing vegetation on forest and grasslands, and similar factors. By an analysis of production on the standard or ideal land, and the marketing costs at various distances on the different classes of roads, a schedule is prepared showing the percentage reduction in the basic rating of the land for the various locations. Similar schedules are calculated in respect to the other factors.

"As a final result each piece of land is given a rating in terms of the percentage of the standard for the area or region. The proper government officials need to place an appraisal value on the standard land, and every piece of land in the area takes its appraisal value strictly in accordance with its productive capacity. It must be emphasized that the physical data are kept separated from the economic, including the basic ratings of the natural land types. As a result of any changes in economic conditions the necessary adjustments of the ultimate land classification can be made easily without additional field work."

Essentials of a general system of classifying organic soils, A. P. DACHNOWSKI-STOKES (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 416–418*).—This contribution from the U. S. D. A. Bureau of Chemistry and Soils summarizes and outlines a system of organic soil and peat classification which has been more fully presented elsewhere (E. S. R., 74, p. 747).

Character and classification of the organic soils of the delta region, California, S. W. COSBY and C. F. SHAW (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 413–416*).—A very brief discussion contributed from the University of California outlines the organic soil system recently proposed by Cosby (E. S. R., 74, p. 750), pointing out, in conclusion, that "there is a clear-cut distinction between peat, a raw material, and organic soil, a product of pedologic processes acting upon accumulated plant remains. Organic soils can be identified and differentiated in accordance with the same pedologic principles that are applied to mineral soils. . . . Organic soils are capable of being classified in a taxonomic system that parallels the one now in use for mineral soils. . . .

"The several series and types of organic soils which have been separated in accordance with the foregoing concept are agronomically distinct in the delta region and show definite differences in crop adaptations and yields."

The meaning of the term Solonetz, C. F. SHAW and W. P. KELLEY (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp 330–334, pls. 2*).—Certain discrepancies between the chemical and morphological concepts of "Solonetz", as illustrated specifically by some of the California soils, are discussed in a contribution from the University of California, much of the observational material used being the same as that previously presented by Kelley (E. S. R., 74, p. 453).

[Soil Survey Reports, 1931 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1931, Nos. 22, pp. 35, pl. 1, figs. 2, map 1; 24, pp. 41, figs. 2, map 1*).—The two surveys here noted were prepared with the cooperation of the respective State experiment stations.

No. 22. *Soil survey of Livingston Parish, Louisiana.* A. C. Anderson et al.—Livingston Parish forms an area of 410,880 acres in southeastern Louisiana. "The benchlike areas near streams have good drainage, but flat wet areas occur at a distance from the larger streams. The central and western parts are largely a flat silty imperfectly drained old Mississippi River terrace covered with hardwood and pine. Lake Maurepas Swamp covers the southeastern part, and fingers of swamp extend up all the stream bottoms."

The soils of the area consist of 15.5 percent of Denham silt loam, 16.3 percent of Calhoun silt loam, 10.7 percent of Frost silt loam, and others of lesser extent, making a total of 30 types listed as 22 series. "About 65 percent of the area of the parish is classed as farming soils and 35 percent as forestry and grazing soils. Most of the forestry and grazing soils are too wet to farm."

No. 24. *Soil survey of Craig County, Oklahoma*, A. C. Anderson et al.—Craig County, northeastern Oklahoma, occupies 486,400 acres largely consisting of gently rolling prairie.

The soils were found to constitute 14 series, inclusive of 24 types. Parsons silt loam, covering 19.3 percent of the total area; Bates silt loam 14.2 percent; and Summit silty clay loam 10.1 percent, are the most extensive soil areas. Chemical analyses, results of fertilizer trials, and recommendations for the management of the soils of the county, by H. J. Harper, are included.

Weathering and soil-formation, C. C. NIKIFOROFF (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 324–326*).—This brief contribution from the U. S. D. A. Bureau of Chemistry and Soils emphasizes particularly the essential character of the biological factor in true soil formation.

"The products of weathering as such are regarded as a parent material from which and under certain conditions the soil can be developed. Thus becomes apparent a distinct demarcation between the weathering and the soil formation proper, as well as between the soil and its parent material. . . . There are some lifeless areas on the surface of the earth. . . . The bedrocks exposed in these regions are subject to destruction by weathering. The earth's dust produced by this can be assorted and redeposited; its soluble salts can be leached or concentrated, but so far as its surface is not occupied by a living substance, it remains a passive parent material and does not develop a true soil."

On the determination of the water-holding capacity of the soil [trans. title], M. TRENEL (*3 Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 15–17*).—The author describes a capillarimeter in which a negative pressure in the water-saturated pore space of the soil is produced by the descending water surface, this negative pressure, expressed in centimeters of water column, being taken as the index of the capillary power (the height of the capillary rise) of water in the soil under examination. It is proposed to substitute the determination of this capillary power by means of the capillarimeter for the determination of the water capacity and to express the relation of the soil to water by means of this capillarity figure alone.

The determination of the pF at permanent wilting and at the moisture equivalent by the freezing point method, R. K. SCHOFIELD and J. V. BOTELHO DA COSTA (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 6–10, fig. 1*).—The authors of this contribution from the Rothamsted Experimental Station have modified the freezing point depression determination method of Bouyoucos and McCool (E. S. R., 38, p. 10) "to insure (1) that before freezing is started (by giving a sharp twist to the Beckmann thermometer) the sample of moist soil is at a known uniform temperature about 1° C. below the freezing point; (2) that when the freezing is started the tube containing the soil and thermometer is in an air jacket surrounded by a freezing mixture at a temperature close to that finally attained by the partly frozen soil.

"The first precaution is needed in order that the amount of ice formed may be computed. This must be subtracted from the total moisture content to obtain the water content corresponding to the measured freezing point. If the second precaution is not taken, and the air jacket is surrounded by a cooling mixture (as in Bouyoucos' experiments), the maximum temperature recorded after freezing starts is merely the result of a balance between the heating due to solidification and the cooling caused by the surroundings."

A mechanized procedure for determining the sticky point of soils, L. B. OLMSTEAD (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 5, 6*).—The author reports from the U. S. D. A. Bureau of Chemistry and Soils that "more nearly reproducible results were obtained when the spatula

was replaced by a thin polished steel disk rotated at any desired speed through reducing gears by a small variable speed electric motor, the soil sample being held against the edge of the rotating disk. This device, although an improvement over the spatula, was not so satisfactory as was a smooth roller. The apparatus consists of a polished steel roller exactly 5 cm in diameter and about 15 to 20 cm long, mounted horizontally 3–4 mm above a movable flat steel plate, and rotated by a hand crank. A 15–20-g soil sample, moistened and thoroughly kneaded, is placed on the plate and fed against the roller.

"The desired sticky point is reached when the soil just fails to stick to the roller at a prescribed shearing speed. This point can easily, repeatedly, and continuously be checked on each sample by varying the rotational speed of the roller. At higher speeds the sample sticks to the roller, and at slower speed the roller clears. By this procedure better agreement between replicate determinations has been obtained than by any of the other methods so far investigated. The greatest variations in results occur in silty soils low in colloid which are nearly nonplastic in the Atterberg meaning of the term and consequently nearly nonsticky. One is not troubled with the presence of a thin film of soil material on the roller, such as is often found coating the spatula blade. Neither is there the uncertainty which often occurs in the spatula test of how to interpret the appearance of the metal surface."

The author has thus far carried out the determinations at a shearing speed of 5 cm per second.

The interpenetration of the diffuse double layers surrounding soil particles, R. K. SCHOFIELD (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 30–33, figs. 2*).—The author presents evidence, obtained at the Rothamsted Experimental Station, indicating that the simple equation, $x^2=y(y+z)$, for the Donnan membrane equilibrium is not applicable to soils because the diffuse double layers surrounding neighboring particles only interpenetrate to a limited extent. Freezing-point measurements of moist Li^{+}, Na^{+}, K^{+}, Mg^{++}, Ca^{++}, and acid-washed soils demonstrate that the interpenetration is less the wetter the soil. The additional freezing-point depression due to ionic dissociation is, broadly speaking, a measure of the repulsive pressure caused by the interpenetration of the diffuse double layers which is liable to destroy the structure of alkali soils.

The binding forces between clay particles in a soil crumb, E. W. RUSSELL (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 26–29, fig. 1*).—In a contribution from the Rothamsted Experimental Station the author advances the hypothesis that clay particles are held together in a crumb by orientated molecules of a polar liquid. "This liquid was the dispersion medium in the paste from which the crumb was formed. These polar molecules lie between the negative charges on the clay surface and the exchangeable cations that have dissociated from the clay, and they are strongly orientated in the electrostatic field between these charges. The binding link postulated between two clay particles consists of three units—orientated molecules, an exchangeable cation, orientated molecules—and it binds a negative charge on the surface of one clay particle to a negative charge on the surface of a second. This hypothesis accounts satisfactorily for the main experimental facts concerning the hardness of crumbs and the conditions under which they are formed."

The effect of different colloidal soil materials on the toxicity of calcium arsenate to millet, P. L. GILE (*Jour. Agr. Res. [U. S.], 52 (1936), No. 7, pp. 477–491, figs. 2*).—On the basis of the results of pot experiments carried out at the U. S. D. A. Bureau of Chemistry and Soils "it appears that whole soils

could show resistances to calcium arsenate injury as variable as the following: Soils that are made up of practically pure quartz sand, 4 lb. of As_2O_5 per acre; soils with 20 percent of colloid of average arsenic resistance, 192 lb. of As_2O_5; and soils containing 60 percent of colloid of exceptionally high specific resistance, 2,112 lb. of As_2O_5."

The effect of the colloid on calcium arsenate appeared not to be influenced by the phosphate fertilization, by the acidity of the colloid, or by the presence of calcium carbonate, but it did appear to be influenced by the chemical composition of the colloid. "The arsenic values of the colloids correspond roughly with the silica-sesquioxide ratios of the colloids, with the simple percentage of iron, and with the ratio of iron to silica plus alumina. The coefficients of correlation with these features of the chemical composition are, respectively, -0.68 ± 0.06, $+0.59\pm0.07$, and $+0.55\pm0.08$. It is concluded that the effect of the colloid is dependent on the quantity and reactivity of the iron present.

"A comparison of the arsenic values with figures previously obtained for phosphate rendered unavailable by soil colloids tends to support the conclusion that the effect of the colloid on calcium arsenate is dependent only on the iron, whereas the effect on superphosphate is dependent on the phosphate, iron, and alumina contents of the colloid."

Minimum water of saturation, L. B. OLMSTEAD (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 4, 5*).—The procedure devised at the U. S. D. A. Bureau of Chemistry and Soils is carried out as follows:

"A sample of about 2 to 3 g of soil material, which has passed a 2-mm sieve, is moistened and worked between the thumbs and index fingers preferably into a cubical form whose edge is about 1.5 cm in length. The sample is worked to a minimum volume by slightly deforming the shape of the sample with the fingers. The desired end point is reached when the lowest moisture content which will produce a glistening appearance at the soil surface is attained. If the molded mass is too dry a drop of distilled water may be added to the upper surface. If the sample is too wet water may be drained away by lightly touching the lower surface of the cube to a clean, dry glass plate. If care in manipulation is taken it is possible to mold the material when its moisture content is at or above the sticky point without having it adhere to the thumbs and fingers. In case of sandy soils it is necessary to start with a moisture content above the desired end point." In the case of plastic clay soils the procedure is modified to the extent that the sample is molded into a more nearly spherical shape and then lightly tapped a few times against a clean, dry glass plate. "When the desired end point is reached a narrow glistening ring appears on the soil surface surrounding the area which has been flattened by the tapping."

It is noted that, like the determinations of the sticky point and of the other Atterberg soil constants, the determination here proposed depends upon the personal judgment of the investigator, but discrepancies from this source are likely to be lessened by the fact that the proposed method is a minimum value determination; and "it appears likely that this new soil-water relation may prove to be a more useful single-value soil constant than the sticky point because it can be determined for all soils, whereas the sticky point is a property of plastic soils only, using the term 'plastic' in the Atterberg sense."

The effect of irrigation and dry fallow on a heavy, base saturated soil, H. GREENE and O. W. SNOW (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 21–24, fig. 1*).—The authors report briefly upon an investigation not yet completed, presenting the conclusions, from a part of the completed experiments, that "a close relation exists between the degree of dis-

persion (1) in water and (2) in a solution of sodium carbonate. In the latter case an important physical characteristic of the soil persists in spite of the almost instantaneous displacement of divalent exchangeable bases by sodium. The aggregation of clay particles is thus to some degree independent of their exchangeable base content, and independent also of hydrolysis of the colloid-cation link which presumably is more advanced in the sodium-saturated material than in the natural soil. There is, however, a possibility that the changes observed may depend on the formation and rupture of chemical bonds between acidoid components of the soil complex, irrigation leading to hydration and separation of the particles and desiccation having the opposite effect."

Micropopulations correlated to decomposition processes, C. THOM (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 160–163*).—This contribution from the U. S. D. A. Bureau of Plant Industry is a condensed résumé of the present view of microbiological activities in the soil and their economic significance. It is stated that "the data accumulated justify the hope that we may look forward to a time when we can answer such questions as: What totals and kinds of micro-organisms do we want in the soil? How can we control their activities to combine with green plants in producing the largest possible yields with the least losses of soil fertility?"

The residual effects of some leguminous crops, T. L LYON ([*New York*] *Cornell Sta. Bul. 645 (1936), pp. 17, figs. 4*).—Alfalfa, sweetclover, red and alsike clovers separately and together, sweetclover and vetch together, soybeans, field beans, peas and oats, vetch and wheat together, and rye were grown in annual alternation with cereal and cereal crops (barley and rye) in an experiment continued through 9 yr. to determine the effects of the legumes upon succeeding cereal crops. In each of the two series of plats the same cereal was grown throughout any one year, but the two cereal indicator crops were themselves alternated, producing the order barley, legume, rye, legume, barley, legume, etc.

"Cereals yielded more when they followed alfalfa than when they followed any other legume. Following red, alsike, and sweetclover, respectively, the yield of cereals was about equal. Soybeans and field beans influenced the yield of cereals much less favorably than did the clovers. Vetch grown with wheat, and peas grown with oats, had about the same effect on the growth of succeeding cereals as did soybeans and field beans. The yields of cereals following any of these legumes were greater than the yields of the same cereals grown in a rotation containing only cereals. The legumes themselves differed greatly in yield of dry matter. Alfalfa gave annual cuttings more than twice as large as those of any of the clovers. Soybeans produced materially more dry matter than did any of the clovers. The outstanding feature of the clovers was the superior yield of the mixture of red and alsike as compared with either of these clovers grown singly. Peas and oats grown together were the least productive of any of the crops containing legumes but did not fall much below the clovers in yield. Vetch and wheat outyielded the clovers.

"The production of cereal grain when grown in alternation with legumes was increased by each kind of legume in about the same way as was the entire cereal crop (grain and straw). Cereal grain yielded more when following alfalfa than when following any other legume, and cereal grain following vetch and wheat yielded the least. Of the four grain-producing legumes, field beans yielded the most grain, soybeans came next, and vetch and peas yielded the least.

"The production of total digestible nutrients was greatest for the alfalfa rotation and least for the rotation containing cereals only. The soybean and

all the clover rotations ranked next to the alfalfa rotation. Rotations having annual legumes other than soybeans were less productive of digestible nutrients.

"There were marked differences between the annual legumes and the others in respect to their influence on the nitrogen content of the succeeding crops. The annuals were much less effective in this nitrogen relationship than were the perennial or the biennial legumes."

Reduction of nodule numbers and growth produced by the addition of sodium nitrate to lucerne in sand culture, H. G. THORNTON and H. NICOL (*Jour. Agr. Sci. [England], 26 (1936), No. 2, pp. 173–188, figs. 5*).—In a sand culture test with inoculated alfalfa in pots there was no correlation between yields or nitrogen content and dosage of nitrate applied, but the number of nodules, though unaffected by 1 g of sodium nitrate per pot, was progressively decreased by stronger dosages. The length of the nodules was reduced about 30 percent by 1 g of the nitrate and decreased progressively by the stronger dosages.

Since the nodules showed a definite relationship between their over-all length and the volume of bacteria contained, the mean volumes of bacterial tissue per nodule and per pot for each series could be calculated. The reduction effected by the nitrate was far greater as thus measured, owing to the small contribution of bacterial tissue derived from nodules less than 1.5 mm long.

Since increased dosages of nitrate progressively decreased the numbers of nodules and their content in bacterial tissue per gram of root, the effect of the nitrate was not due to reduced root growth.

Complex ions in relation to the electrodialysis of peat, B. D. WILSON and E. V. STAKER (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 426–428*).—The authors of this contribution from the [New York] Cornell Experiment Station conclude that, on the basis of such evidence as is available, "it appears that, during the electrodialysis of peat, metallic ions are transported to the anode as parts of complex organic anions. It is possible that the silicon which is sometimes found at the cathode is a part of a complex organic ion electropositively charged. The observations here reported may have some relation to the findings of Anderson and Byers [E. S. R., 70, p. 160], who have been led to presume that some of the organic matter which is soluble in acids is in the form of complex organic cations."

The availability to crops of the nitrogen of Everglades peat, J. R. NELLER (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 421–423*).—It is reported from the Florida Everglades Experiment Station that sawgrass peat, in field and greenhouse tests, showed little response to nitrogenous fertilizers in 5 yr. of cropping; that a need for potassium fertilizers developed early; and that after several crops had been taken a phosphate requirement made itself evident.

"The nitrogen content of the soil ranges from 3 to 3.8 percent in the more weathered surface horizon and is somewhat less in the subsurface masses. Nitrate nitrogen varies from 50 to 200 p. p. m. in the top 12 in. (30 cm), depending upon the season of the year. At lower depths the concentration of nitrates decreases rapidly."

The response to green manuring of crop growth on Everglades peat, J. R. NELLER and A. DAANE (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 423–425*).—In the sawgrass peat lands above noted, the yield weights of stover being based upon that from the fallowed plat, "the soybeans, velvet beans, and cowpeas that were plowed under resulted in increased corn weights

of 31, 43, and 24 percent, respectively. Where the cowpeas were cut and removed the corn growth increase was 18 percent. No benefit was apparent from the use of shallu as a green-manure crop. The tonnage of this material was not much greater, but the fibrous, woody nature of the growth probably resulted in a type of decomposition that was harmful to the succeeding corn crop."

The Cunninghamella plaque method of measuring available phosphorus in soil, A. MEHLICH, E. B. FRED, and E. TRUOG (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 168–171*).—An investigation carried out at the University of Wisconsin included a comparison of the method named with methods utilizing *Aspergillus niger*, of which one form agreed well with the *Cunninghamella* plaque method and with field tests; with the Neubauer method; and with the Mitscherlich pot test. As compared with the Neubauer method and in trials involving 50 soils from various parts of the country, "in general the agreement was satisfactory. Results with 20 soils also showed a good agreement in all cases but one between the Mitscherlich pot test and the *Cunninghamella* test. In the one exception the latter test indicated a higher amount of available phosphorus. In order to determine further the reliability of the *Cunninghamella* method, about 200 soils of known phosphate needs as determined by field tests were obtained from widely separated parts of the United States and tested by the *Cunninghamella* method. The results of the biological method agreed well with the field results."

Report on the investigation of phosphorus-deficient soils, 1935 (*Montana Sta. Bul. 316 (1936), pp. 18, figs. 3*).—This bulletin consists of two parts, tests on legumes and cereals, by J. R. Green, and phosphorus tests on potatoes, 1935, by F. M. Harrington.

The first article notes good responses from the use of phosphates on 21 out of 55 farms in 1935. Substantial increases of the yield of alfalfa were obtained on 20 out of 54 fields; of the wheat yield in 8 out of 24 tests; of the yield of oats in 6 out of 19 trials; of barley, treated with treble superphosphate and with ammoniated phosphate, in 3 out of 5 trials; and of canning peas on 8 fields treated with 125 lb. of treble superphosphate per acre. Phosphate trials on 7 farms showed no significant effect on commercial mustard.

"Owing to the variations of the response of the different soils, it is recommended that limited fertilizer trials be made on each farm."

The second article indicates that phosphorus had direct value in every plat studied in 1935, the results being similar to those reported for the 1934 season (E. S. R., 73, p. 162). "Increased yields have generally prevailed. Improvement in grade has occurred in every plat, and better handling and storage qualities are reflected in the improvement in maturity. Most plats have benefited in all points named, and the conclusion must be that phosphorus is a valuable factor in potato production in Montana. . . . A relatively small increase in the No. 1 potatoes would pay the fertilizer bill, and the other benefits, such as maturity, would be in addition."

The influence of varying amounts of water-soluble phosphorus in different soil types on the response of cultivated crops, O. C. BRYAN and W. M. NEAL (*Jour. Agr. Res. [U. S.]. 53 (1936), No. 6, pp. 459–466, figs. 4*).—At the Florida Experiment Station various quantities of superphosphate (0 to 8,000 lb. per acre) were added to Norfolk sand, Norfolk fine sand, and Orangeburg fine sandy loam. Mustard, vetch, and sorghum were used as test plants. Water-soluble phosphorus in soil extracts, yields of crops, and phosphorus content of the plants were determined.

"The plants did not respond to a concentration of water-soluble phosphorus greater than 2 p. p. m. A concentration of 0.5 part was necessary to secure

appreciable growth of sorghum. The greatest response to phosphate addition was on the Orangeburg soil. The phosphorus content of the plants was proportional to the water-soluble phosphorus content of the soil. Because of the high fixing power of the Orangeburg soil for phosphorus, larger applications of the element were necessary for maximum results."

A review of the experimental work with phosphate in Montana, 1928 to 1935: The effect of phosphate on plants, J. R. GREEN (*Montana Sta. Circ. 148 (1936), pp. 1–11, figs. 6*).—The author notes briefly the effects of phosphatic fertilizers on sugar beets, alfalfa, sweetclover, peas, beans, and small grains, on the phosphorus content of grains, and on potatoes. Ammoniated phosphate, raw rock phosphate, residual effect of phosphate, application of phosphate, the economics of fertilizers, and tests to determine phosphorus deficiency are also discussed.

Of the experiments with beets, it is noted that "in a few areas, where the soils were quite deficient in phosphorus, increases in yields up to 15 tons per acre have been recorded. Between 2 and 3 tons per acre may be considered an average increase." In 36 samples of wheat from phosphated land compared with the same number from adjacent untreated land, "the percentage of phosphorus in the former was 3.2 percent more than that in the latter." Of the outstanding results with potatoes, it is recorded that "12 trials with 125 lb. of treble superphosphate per acre gave an average increase in yield of 2,622 lb. of potatoes per acre. Eight trials with the same amount of ammoniated phosphate gave an average increase of 2,422 lb. of potatoes per acre." An increased percentage of this crop was of high grade when it was grown on phosphated land.

Ammoniated superphosphate is considered to be especially valuable in the building up of soils deficient in humus and nitrogen content. Raw rock phosphate "may have a value on soils with an ample supply of humus, but its use on mountain soils should be investigated further. Indications are that it may have a limited use in regions adjacent to a very cheap supply of the natural rock." The use of treble superphosphate for quick returns was found to be "fully justified."

The Winogradsky soil-plaque method (E. S. R., 66, p. 616) was found a very satisfactory means of determining phosphate deficiencies.

The comparative effects of lime and magnesia on the argillaceous and humic colloids [trans. title], C. BRIOUX and E. JOUIS (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 19, 20*).—It was found that although the calcium and magnesium ions are of a very similar degree of effectiveness in the flocculation of colloidal clays, the magnesium ion was very much less active in this respect than was the calcium ion in the case of colloidal humus. The magnesium ion even appeared, in certain cases, to act rather as a dispersant than as a coagulant of the humus. Treating an acid, humiferous, sandy soil with 0.02 N solutions of the bicarbonates of calcium and of magnesium, for example, the authors found 25 mg in 1 l of the calcium salt extract as against 92 mg in the extract made with the magnesium bicarbonate solution.

They conclude that magnesium lime should be used with caution on light sandy soils more or less well provided with organic matter.

Some bacteriological and chemical effects of calcium and magnesium limestones on certain acid Iowa soils, H. L. DEAN and R. H. WALKER (*Iowa Sta. Res. Bul. 196 (1936), pp. 153–182, figs. 2*).—The authors report an investigation of the comparative effects of calcium and magnesium limestones applied to Carrington loam, Tama silt loam, and Grundy silt loam. The effects of the limestones on the H-ion concentration, the lime requirement, the exchangeable

hydrogen, calcium, and magnesium, and the degree of saturation of the exchange complex with bases were recorded, as were also the nitrate content and the nitrifying power of these soils as influenced by the two limestones, and the yields of wheat and of red clover on the Carrington loam and the Tama silt loam treated with the two limestones.

The data indicate that the calcium limestone reacted somewhat more rapidly with the soil acids than did the magnesium limestone, and that it reduced the acidity more and brought about a greater production of nitrates in the soil during the first few weeks after the limestones were applied. However, "this advantage of the calcium limestone was apparently overcome by the magnesium limestone rather quickly, and after 8 to 12 weeks there was no apparent difference in the effects of the two limestones on any of the chemical or bacteriological characteristics of the soils studied. Neither limestone was superior in its effects on the yields of wheat and clover."

It is concluded that in agricultural practice either limestone may advantageously be used to correct the acidity of soils, their long-time effects being practically identical.

The effects of liming on the liberation of potassium in some Iowa soils, H. C. DEAN (*Iowa Sta. Res. Bul. 197 (1936), pp. 185–208, figs. 5*).—This bulletin reports a laboratory and greenhouse investigation involving (1) an analysis of 12 high-lime Iowa soils, (2) the effect of calcium carbonate on some exchange reactions in an acid soil, (3) the effect of certain calcium compounds on the exchangeable and available potassium in acid and basic soils, (4) the absorption of potassium and calcium by inorganic colloids, and (5) the biological fixation of potassium in several Iowa soils.

Analyses of 12 soils showed that all of the soils of high-lime content contained relatively large total potassium, carbonate, and total nitrogen contents. "The available potassium content of 11 of the 12 high-lime soils was insufficient for maximum plant growth according to the *Aspergillus niger* test. This low content of available potassium was correlated with the high carbonate content."

"The availability of potassium in high-lime soils was lower in inoculated than in uninoculated soils, and the decrease in availability was greater in soils treated with calcium carbonate than in the untreated soils. It is suggested that a decreased hydrolysis of primary potassium-bearing minerals and the formation of insoluble potassium complexes and possibly also a reduction in available potassium by micro-organic activity may be responsible, in part at least, for the decreased availability of potassium in these soils."

The exchange complex of an acid Tama silt loam having been completely saturated by applications of 6 tons of calcium carbonate per acre in greenhouse experiments, the percentage of exchangeable and available potassium were found to have decreased 6 mo. after treatment. "Calcium carbonate, calcium chloride, and calcium hydroxide replaced potassium and increased the available potassium in the soil exchange complex in acid Tama silt loam and to a smaller extent in basic Webster silty clay loam, calcium chloride being the most effective. Calcium sulfate had little or no effect on the exchangeable and available potassium."

The function of copper in soils and its relation to the availability of iron and manganese, L. G. WILLIS and J. R. PILAND (*Jour. Agr. Res. [U. S.], 52 (1936), No. 6, pp. 467–476, figs. 5*).—Corn grown on an unproductive peat soil at the North Carolina Experiment Station became chlorotic when copper sulfate was added to the soil. "The chlorosis was identified as being due to an iron deficiency when ferrous sulfate applied externally to the leaves caused the development of a green color. The application of manganese sulfate alone or

in combination with ferrous sulfate had no visible effect. Cotton plants grown in solution cultures containing either nitrate or ammoniacal nitrogen and ferric citrate, copper, manganese and zinc sulfates, and boric acid developed an iron-deficiency chlorosis in their early growth. In a repetition of the work, with the addition of manganese, zinc, copper, and boron delayed, a chlorosis developed in the plants receiving nitrate nitrogen when they were 2 ft. high. Following the elimination of the four elements from the solution the affected plants rapidly became green.

"An experiment in which the roots of iron-deficient cotton plants were divided between two solution cultures has given evidence that copper sulfate will produce an iron-deficiency chlorosis. It appears that this effect is due largely to reactions external to the plant, but there is also evidence of immobilization of iron within the plant under the influence of copper. Further evidence in support of the assumption that copper serves as a catalyst of oxidation-reduction reactions is presented by a preliminary study of a field soil problem. The soil contained abnormally large quantities of water-soluble and exchangeable manganese. Beneficial effects were observed following applications of copper sulfate or a prolonged drying of the soil.

"Copper sulfate serves as a soil amendment, decreasing the availability of iron and possibly of manganese. The effect may be favorable or not depending on the oxidation intensity and the iron and manganese content of the soil."

Fertilizer reaction, soil amendments, and crop production, H. B. MANN and J. J. SKINNER (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 196–198*).—The U. S. D. A. Bureau of Plant Industry, in cooperation with the North Carolina Experiment Station, finds that apparently "in determining the efficient use of acid-forming fertilizers of low or high concentration, on soils of the coastal section of the southeastern United States, the chemical composition and the reaction of the soil, as well as the nutrient requirements and acid tolerance of the crops to be grown, must be taken in consideration."

The preparation of fertilizer briquettes and their utilization in general agricultural practice, F. E. HANCE (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 258–260*).—This note summarizes work previously published (E. S. R., 72, p. 21) and adds more recently developed formulas.

AGRICULTURAL BOTANY

Abstracts of the papers presented before the physiological section of the Botanical Society of America, St. Louis, Mo., December 31, 1935–January 2, 1936 (*Amer. Jour. Bot., 22 (1935), No. 10, pp. 903–916*).—Abstracts of the following papers are included: The Germination of *Lobelia inflata* Seeds, by W. C. Muenscher (Cornell University) (p. 903); The Apparent Photosynthesis of an Entire Apple Tree Every Day From Pre-bloom to Leaf Fall, 1935, by A. J. Heinicke (Cornell University) (pp. 903, 904); Lethal and Sub-lethal Effects of Monochromatic Ultra-violet Radiation on Microorganisms in Liquid Suspensions, by A. Hollaender, W. D. Claus, and J. T. Curtis (University of Wisconsin) (p. 904); Change in Mineral Composition of the Tomato Plant With Irradiation Under a Quartz-Mercury Vapor Lamp and its Relation to the Level and Ratio of Calcium and Phosphorus in the Nutritive Medium (pp. 904, 905) and An Improved, Standardized Method for Ashing of Plant Material (p. 905), both by W. D. Stewart and J. M. Arthur; Leaf Temperatures and the Cooling of Leaves by Radiation, by O. F. Curtis (Cornell University) (pp. 905, 906); The Effect of Soil in Relation to Nitrate Solution on the Germination of Seed of *Poa compressa*, by A. M. Andersen (p. 906); The Cause of the

Electrical Phenomena in Plants, by W. E. Burge and R. Krouse (University of Illinois) (pp. 906, 907); The Response of Plants to Localized Applications of Various Chemical Agents, by M. Levine (pp. 907, 908); The Rôle of Auxin in the Development of Intumescences on Poplar Leaves, in the Production of Cell Outgrowths in the Tunnels of Leaf-Miners, and in the Leaf-Fall in Coleus, by C. D. LaRue (p. 908); Use of Physiological Responses for Determining Absorption and Transport of Synthetic Growth Substances Added to Soil, by A. E. Hitchcock and P. W. Zimmerman (p. 909); The Initiation and Growth of Secondary Roots From Roots Induced by Growth Substances (pp. 909, 910) and The Effect of Subjecting Plants to Light and Dark Prior to Treatment With Growth Substances (p. 910), both by P. W. Zimmerman and A. E. Hitchcock; Plant Responses to Some Indole Derivatives, by L. C. Bauguess (University of Iowa) (pp. 910, 911); The Influence of Ethylene on Stem Growth of Tomato Plants, by C. G. Deuber (p. 911); Failure of Paraffine to Stimulate Yeast Growth With Reference to the Effect of Heavy Water, by O. W. Richards (p. 911); Comparative Effects of Certain Aldehydes on the Viruses of Typical Tobacco Mosaic and Tobacco Ring Spot, by B. M. Duggar and T. Easley (University of Wisconsin) (p. 912); Comparative Studies on Metabolism of Healthy and Mosaic-Infected Tobacco Leaves: Respiration Studies, by P. Lemmon (University of Wisconsin) (p. 912); Criteria of Sensitivity in *Mimosa pudica*, by H. J. Fuller, W. E. Burge, and G. C. Wickwire (University of Illinois) (pp. 912, 913); Oxidation-Reduction Potentials in Relation to Growth of Fungi on Liquid Culture Media, by D. F. McAlister (University of Wisconsin) (p. 913); Effect of Variation in Rate of Water Flow Upon Development of Top and Root System of Young Squash and Castor Oil Plants Grown by Sheet-Culture Technique, by M. A. Raines (pp. 913, 914); Cultures of Spermatophyte Tissues, by C. D. LaRue (p. 914); Growth Studies on Excised Root Tips, by G. C. Galligar (p. 915); Distribution of Ascorbic Acid (Vitamin C) in Roots, Stems, and Leaves of *Vigna sinensis*, by M. E. Reid (p. 915); Effect of Certain Nutrient Deficiencies on Stomatal Behavior, by M. C. Desai (Cornell University) (p. 915); and Studies on Nitrogen Fixation by *Rhizobium* Species in Pure Culture, by D. G. Clark (Cornell University) (pp. 915, 916).

The role of light in the life of plants.—I, Light and physiological processes, P. R. BURKHOLDER (*Bot. Rev., 2 (1936), No. 1, pp. 52, figs. 3*).—In this comprehensive review the following phases of the subject are discussed: The relation of light to biological processes; photosynthesis; the formation of chlorophyll and other pigments; chromatic adaptation; photodynamic action; transpiration; absorption and use of solutes; permeability; protoplasmic movement; assimilation: carbohydrate-nitrogen ratio; inorganic elements; acidity, stomatal movements, etc.; photoperiodic stimulation; the reduction-oxidation ratio; enzymes; vitamins; seed germination; growth substances; and electric potential.

Seed germination in Lobelia, with special reference to the influence of light on Lobelia inflata, W. C. MUENSCHER (*Jour. Agr. Res. [U. S.], 52 (1936), No. 8, pp. 627–631*).—This study by the [New York] Cornell Experiment Station "demonstrated that light is necessary for the germination of *L. Inflata* seeds. Of the several other treatments given to the seeds, none acted as a substitute for light to bring about germination. When *L. inflata* seeds were sown on the soil surface in a garden, good germination was obtained, but practically no germination was obtained when the seeds were covered with 1 cm of soil. The seeds retained their viability for at least 5 yr. in dry storage under laboratory conditions. Tests with other species of *Lobelia* indicate that *L. cardinalis* and *L. siphilitica* also require light for germination. The seeds of *L. tenuior*,

five forms of *L. erinus*, and *L. dortmanna* germinate about equally well in light or darkness. Seeds of *L. dortmanna* lose their viability upon drying. Seeds stored in water at a temperature of from 1° to 3° C. retain their viability for at least 4 mo."

Further studies of the limits of photosynthesis, G. R. BURNS *(Vermont Sta. Bul. 402 (1936). pp. 16, figs. 3).*—The light sources used in this study were four 1,000-w, projection type lamps operated at constant (± 0.2 percent) voltage and placed at the four corners of a rectangle with the plants in the center, the lights and plants being at the same level. Light-filtering solutions (formulas given) were used to give red, yellow, and blue lights, respectively. Trees from 4-year-old nursery stock of white pine and Norway spruce, potted 2 mo. previously, were placed in small, cubical greenhouses glazed with infra-red-red or blue-violet transmitting glass. After holding in the filter houses for 2 weeks or longer, they were taken to the laboratory and their photosynthetic efficiency in the infrared-red or blue-violet radiations relative to that in the middle portion of the spectrum was determined, the crown of each tree being sealed in a bell jar containing about 1 percent CO_2, placing it in such an intensity of white light that the respiration was equal to photosynthesis and determining the amount of CO_2 by gas analysis. Then the tree was placed under one of the colored lights for 2 hr., returned to the white light, and a second CO_2 analysis made. The light filters were then changed, and the run was repeated under a different colored light. Two trees were used in each run, so that the interval between the first and second runs was about 1½ hr. The uneven response of a tree to a given light color on different days was due in part to the fact that, while care was taken to see that the trees were in the same positions during each pair of runs, no attempt was made to see that the positions were the same on different days.

The results at the red end of the spectrum were uniform. Trees from the blue house used the red radiation less efficiently than those grown outdoors and much less so than those grown in the red house, and the longer the tree was in the blue house the lower was its efficiency in red light. The opposite was true for trees grown in the red house. The observed changes were larger than the experimental error. The figures for the blue end of the spectrum revealed no regularities, one reason perhaps being that the portion of the spectrum used in investigating this point was not particularly suitable. The total chlorophyll (on the wet weight basis) was 10 percent higher in the pines from the blue house, while carotene and xanthophyll were about 5 percent lower than those from the red. Speculations as to the cause of this change in efficiency are deemed perhaps idle on the basis of the data at present available. In the yellow light the plants were receiving about 10 quanta of light per molecule of CO_2 reduced, so that any increase in efficiency could as well be attributed to a better use of absorbed light of a given wave length. While it appears probable that the efficiency in the yellow light is constant and that the change is in efficiency in the blue and the red lights, it is possible that the efficiency in the yellow changed. The large changes noted at the red end of the spectrum, as well as their apparent regularity, point to the operation of a single, and perhaps discoverable, factor.

From the viewpoint of the short wave limit of photosynthesis it appears as though these two species were unable to use light in the blue-violet part of the spectrum, as well as that near the center of the visible spectrum, and the calculated limits of photosynthesis ranged from 448 to 467 mμ. Thus growing the trees under different lights had a slight and irregular effect on this limit. The comparisons between the sodium lights and the yellow light

indicated that the former had an efficiency of 1.23±0.04 with pine and of 1.24±0.01 with spruce.

It is believed that the main reason for the higher efficiency of the sodium lights lay in the fact that the area of the source was about 100 times that of the incandescent lights. However, if photosynthesis depends on light absorption by chlorophyll a, this radiation, consisting largely of the two sodium lines near 590 mμ, would be handicapped.

Some phases of the mitogenetic ray phenomenon, A. HOLLAENDER and W. D. CLAUS (*Jour. Opt. Soc. Amer., 25 (1935), No. 9, pp. 270–286, figs. 6*).—This critical review from the University of Wisconsin, prepared under the auspices of the National Research Council, discusses the subject under biological detectors, physical detectors, properties of mitogenetic rays (secondary radiation, wavelength determinations, and quantitative effects), senders, and finally under some of the more advanced work.

It is concluded that the existence of mitogenetic rays has thus far neither been proved nor disproved, and it is believed that every effort should be exerted to put the problem on a substantial basis. A program toward the latter end is suggested.

Radio biology in the plant kingdom: The action of cosmic, metal, gamma, and X radiations on growth, V. RIVERA (*Radiobiologia vegetale: Azione delle radiazioni cosmica, da metalli, gamma ed X sull'accrescimento. Roma: G. Bardi, 1935 pp. 449, figs. 68*).—This is a comprehensive monograph on radiation phenomena in plants.

Cell elongation and the electrical properties of the cell wall, J. BONNER and A. N. J. HEYN (*Protoplasma, 24 (1935), No. 3, pp. 466–469*).—The experiments were performed with oat seedlings.

Granule-forming cell substances pass through the living plasmalemma (Observations in the epidermal cells of Allium cepa) [trans. title], O. BANK and K. B. ESTEŘÁK (*Protoplasma, 24 (1935), No. 3, pp. 401–408, figs. 6*).—The intake of dyes (methylene blue, methyl violet, crystal violet, neutral red, and methyl green) indicated that by ensuing plasmolysis with neutral salts granule-forming substances from the protoplasts of the epidermal cells of onion pass through the plasmalemma. The viability of the protoplast remains unchanged, the plasmalemma not appearing to be injured. The colloidal substances withdrawn from the protoplasts and producing granules with the dyes go through characteristic form changes in warm (from 30° to 50° C.) solutions of various nitrates (Na^+, K^+, NH_4^+), which do not occur in cold solutions or in lukewarm solutions of other salts of the same ions. In hot solutions of nitrates changes also occur.

Wound stimulation and plasmolysis with $AgNO_3$ acted like the dyes.

Notes on the possible structure of the chlorophyll-granules in the plastid, J. G. WAKKIE (*K. Akad. Wetensch. Amsterdam, Proc., 38 (1935), No. 10, pp. 1082–1086, figs. 4*).—

On the structure, development, and distribution of the endodermis and its associated ducts in Senecio vulgaris, W. M. WARDEN (*New Phytol., 34 (1935), No. 5, pp. 361–385, figs. 13*).—This is a detailed study of the morphology of the species and of the influence of different physiological conditions on its morphological development.

The development of the spikelet in Agrostis canina L., W. R. PHILIPSON (*New Phytol., 34 (1935), No. 5, pp. 421–436, figs. 5*).—A brief account is given of the formation of the branches of the panicle and of the development of the young spikelet. The initiation and development of the bracts and floral organs and their vascular supplies as seen in microtome sections are described. The

morphology of the awn is discussed, and it is maintained that the awn represents a part of the blade which has become separated as a dorsal outgrowth.

Evolution of pollen grains, R. P. WODEHOUSE (*Bot. Rev., 2 (1936), No. 2, pp. 67–84, figs. 8*).—This is a comprehensive review.

The electrometric determination of plant quality, using potato tubers [trans. title], H. WARTENBERG, A. HEY, and O. URBAN (*Arb. Biol. Reichsanst. Land u. Forstw., 21 (1933), No. 3, pp. 331–362, figs. 9*).—In this preliminary section of the series the author presents the fundamentals of the subject. After an introductory review of the potential picture with indifferent electrodes he describes the preparatory steps, apparatus, and procedure for potential measurements. In addition he shows the conditions under which the potential values as measured by various platinum electrodes are comparable. Special studies were necessary to elucidate the measuring procedure, the potential drift (standard curve) and its causes, and the potential constancy. These are discussed.

A new method of measuring transpiration, L. S. MINCKLER (*Jour. Forestry, 34 (1936), No. 1, pp. 36–39, fig. 1*).—A method of quantitative measurement, including apparatus, is described as making it possible and practicable to calculate the transpiration of full-sized trees growing in the forest. The principle involved is essentially that the water transpired during a definite time by a group of leaves in situ is absorbed by a hygrometric substance and calculated.

The water relations of plants and an empirical formula for evaporation and transpiration, Y. FUKUDA (*Über die Hydratur der Pflanzen und eine empirische Formel der Verdunstung und Transpiration. Jena: Gustav Fischer, 1935, pp. IV+79, figs. 21*).—After defining the subject, the author of this monograph treats of its subdivisions as follows: A schema for the osmotic power of plant cells; a historical review relating to the rate of water exchange in plants and in the soil: the physical factors of water exchange, and the rate with which the water relations adjust themselves; earlier works on evaporation from cut plant parts; a special equation for the evaporation from cut shoots, and the mathematical handling of the curves of evaporation rates from such shoots; evaporation from wilting and from originally turgid plants; mathematical treatment of the transpiration processes in cut shoots; daily fluctuations of stomatal and cuticular transpiration, and the rate of decline in stomatal transpiration; and a survey of transpiration in plants and of evaporation processes in cut shoots. Two pages of bibliography are included.

Further studies on transport in the cotton plant, I–IV (*Ann. Bot. [London]. 45 (1931), No. 177, pp. 125–173, figs. 4; 48 (1934), No. 189, pp. 119–141, figs. 9; 50 (1936), No. 197, pp. 23–58, pl. 1, figs. 9; 161–174, figs. 6*).—The following papers of the series are included:

I. *Preliminary observations on the transport of phosphorus, potassium, and calcium,* T. G. Mason and E. J. Maskell (pp. 125–173).—This introductory section discusses methods, the effects and responses from ringing, movement to the boll, and the mobilities of different elements within the plant.

II. *An ontogenetic study of concentrations and vertical gradients,* T. G. Mason and E. J. Maskell (pp. 119–141).—The changes during development in the amounts of different materials in successive zones of the main axis were recorded by observations at monthly intervals, with the following results: Polysaccharides accumulated steadily, especially in the bark; total nitrogen in the bark even more markedly than polysaccharides, but little if at all in the wood; phosphorus rapidly in both bark and wood, but with depletion from the lower zones during the final period; calcium steadily in the bark up to the last collec-

tion, and to some extent in the wood; while potassium showed no signs of accumulation.

Where there was evidence of storage in the bark, the vertical concentration gradients (per 100 g of water) were negative. Potassium (with no signs of storage) had a consistent positive gradient. Apparently the negative gradients were due to a negative storage component masking a dynamic component of freely mobile material. Storage of nitrogen in the bark occurred largely as asparagine, and this fraction was responsible for the observed negative gradient of crystalloid nitrogen. Residual nitrogen maintained a consistent positive gradient and may represent the mobile component. The vertical gradients of sugar concentration and of total osmotic pressure in the bark were steep in the early stages when growth was more rapid, but flattened out as development proceeded. Electrolytes may contribute to the total positive osmotic pressure gradient.

III. *Concerning the independence of solute movement in the phloem*, T. G. Mason, E. J. Maskell, and E. Phillis (pp. 23–38).—Following a discussion of the existing theories of phloem transport, the results are given of a study of certain special transport situations in which carbohydrates and nitrogen might be moving in opposite directions along the phloem track. In tests of the movement along the petiole the total carbohydrates and nitrogen behaved similarly, but in neither case was the gain statistically significant. Therefore, although there are grounds for believing that darkened cotton leaves can import carbohydrates via the phloem, there is no evidence as yet that they can at the same time export nitrogen via the phloem. Ringing experiments relative to the movement of mineral nitrogen up the stem led to the conclusion that the xylem alone is concerned, the phloem having little, if any, share. When cotton plants grown in full nutrient solution were deprived of their nutrient supply, nitrogen and other nutrients were exported from the foliage of the basal region to the apical region, while at the same time there was a downward movement of carbohydrate via the phloem from apical to basal region and roots. This upward nitrogen movement was entirely prevented by ringing the stem above and below the basal region. This suggests that the mobilized nitrogen reaching the apical region moves via the phloem in opposition to the downward movement of the carbohydrates, but the theory is not entirely excluded that the mobilized nitrogen may have all passed via the phloem to the roots and from thence back via the xylem.

Phosphorus behaved similarly to nitrogen, except that its liberation into the tracheae apparently could occur in a root region isolated from the foliage. Ringing had but little effect on the upward movement of potassium reserves, but stopped the export to the roots. Thus potassium exported from the foliage via the phloem appears to be liberated fairly easily into the stem tracheae, and it is concluded that most, if not all, of the upward movement of stored potassium can occur via the xylem. There was no evidence of the remobilization of calcium.

IV. *On the simultaneous movement of solutes in opposite directions through the phloem*, E. Phillis and T. G. Mason (pp. 161–174).—After the growth of cotton plants in full nutrient solution for 2.5 mo., all nutrients except calcium and iron were omitted, thus starving the plants of the phloem-mobile elements nitrogen, phosphorus, potassium, etc. The two groups of plants were both ringed below the basal region, but in the second group an additional ring was made between the apical and basal regions. The basal leaves of both groups were covered with paper bags to arrest photosynthesis. In the first group nitrogen traveled in considerable amounts from basal to apical regions, while

little or none entered the apical region of the second group. It is thus inferred that at least some of the nitrogen that entered the apical region of the first group traveled upward in the phloem. Carbohydrate traveled downward in the phloem from the apical region of the first group and entered the basal region.

It is concluded that nitrogen and carbohydrate may travel simultaneously in opposite directions through the phloem.

The theory of assimilation [trans. title], H. Gaffron and K. Wohl (*Naturwissenschaften, 24 (1936), Nos. 6, pp. 81–90; 7, pp. 103–107*).—This is a review of the subject.

The response of plants to localized applications of various chemical agents, M. Levine (*Bul. Torrey Bot. Club, 63 (1936), No. 4, pp. 177–199, pls. 3*).—Painting the apical parts of sunflower stems each week with a solution of coal tar in ether, or with pentane or scharlach R in ether, produced bending of the stems, the plants remaining dwarfed and the growing points giving rise to several small apical branches (witches'-broom effect). Stems of sunflower, *Ricinus*, *Datura*, tobacco, and tomato, and leaves of tobacco and *Bryophyllum* treated with glycine, glumatic acid, *l*-cystine, cysteine hydrochlorate, glutathione, thiophenol, parathiocresol, thioglycolic acid, etc., produced scars and swellings of the previously injured, treated areas. There was no specific difference in the reactions induced by compounds with or without the -SH group. Stems treated with glutathione and glutamic acid consistently showed the greater reactions.

Histologically, in the swellings induced by injury and chemical treatment the reaction tissue was limited in quantity and generally located peripherally to the injury. In the injured, untreated controls the reaction was of the same type but quantitatively smaller, while in plants with crown gall the actively growing tissue was abundant and located on the periphery of the gall. The same type of tissues occurred in all three cases, but the rates of division, differentiation, and aging differed. Crown gall cells divided rapidly and differentiated and aged slowly, while the reverse was true for the cells of reaction tissue induced by chemical treatments. In cancer, cell division is rapid and indefinite and differentiation slow and imperfect, frequently supervened by necrosis.

Chemically induced reaction tissues are the smallest and simplest types of overgrowths, and never attain malignancy. In crown gall proliferation is more abundant than that induced by injury or chemical stimulation, but limited as compared with neoplastic disease in animals and man. While the known chemical stimulants induce greater reactions than in the controls, the plant's protective mechanism apparently inhibits continued responses to continued applications of the same stimulus. The isolation of the chemical agent responsible for growth stimulation and improved technic of application may eventually overcome this inhibition, so that plant overgrowths similar to those due to various parasites may be artificially induced. The nature of the response is believed to be a function of the plant rather than of the stimulus.

Investigations on the influence of certain nutrition factors on the development of hairs on plants [trans. title], R. Schneider (*Flora [Jena], n. ser., 30 (1936), No. 2, pp. 131–152, figs. 50*).—Using species of *Sparmannia*, *Hedera*, and *Berteroa* as test plants, the author studied the effects of various nutrient solutions on the development of leaf hairs.

Effect of thiourea upon apical dominance of tree branch, Y. Asami and T. Kadota (*Jour. Hort. Assoc. Japan, 5 (1934), No. 2, pp. 300–305, figs. 2*).—Soaking the tops of apple seedlings for varying lengths of time in 2 percent

thiourea solution induced loss of apical dominance and sprouting of buds along the soaked portions of the stem. Experiments with grape shoots also indicated a reversion of the direction of dominance and multiple sprout effect.

Vitamins and growth factors in plants: A contribution to the quantitative study of the conditions of action of the factors for growth on Phycomyces [trans. title], W. H. SCHOPFER (*Arch. Mikrobiol., 6 (1935), No. 5, pp. 510–531, figs. 9*).

Investigations of the growth hormones of plants [trans. title], F. KÖGL (*Naturwissenschaften, 23 (1935), No. 50, pp. 839–843, fig. 1*).—This is a critical review of recent work on the subject.

Relation of accessory growth substances to heavy metals, including molybdenum, in the nutrition of Aspergillus niger, R. A. STEINBERG (*Jour. Agr. Res. [U. S.], 53 (1936), No. 6, pp. 439–448*).—The growth and development of *A. niger* ("W" strain) in synthetic nutrient solutions, studied with special reference to the effects of heavy metals and accessory growth substances, indicated that the latter are not required for its nutrition. The decreases in yield consequent on utilization of sucrose purified by alcohol (the procedure for removal of "bios" and "coenzyme R") were due almost entirely to the removal of zinc and of molybdenum. Furthermore, extracts of organic materials, such as yeast decoction or malt extract, when used as a source of assumed accessory growth substances, may cause an increase in growth because of the essential heavy metals contained.

"Molybdenum is essential for the growth and development of *A. niger* and therefore cannot be associated exclusively with the process of nitrogen fixation in bacteria. An optimum solution (5 percent sucrose) for the growth and development of this fungus, containing iron, zinc, copper, manganese, and molybdenum, as well as the usual constituents, has a total salt content of 2.5 g per liter. Experimental precision within 1 percent in the values of percentage maximum yield is attainable with duplicate cultures in replicate trials."

The adequacy of the boron and manganese content of natural nitrate of soda to support plant growth in sand culture, J. W. SHIVE (*New Jersey Stas. Bul. 603 (1936), pp. 36, figs. 18*).—The following results of this study on radish, lettuce, nasturtium, tomato, tobacco, and cotton in sand cultures are reported:

"The natural nitrate of soda as used in these experiments provided, in available form and in sufficient quantity, the boron and manganese necessary for normal growth and development of all the species tested except radish (variety Long Icicle) and lettuce (variety Romaine), in which symptoms of manganese deficiency occurred.

"Boron deficiency symptoms appear early in the growth cycle, develop quickly in all the species grown, and mask other deficiency symptoms if present. Boron deficiency symptoms and the progress of the disease are described for several species. Absence of boron is destructive to the plants of the species grown, but there is a striking difference in response toward boron deficiency between plants of the different species and also between plants of different varieties in the same species, relative to the time required for development and to the degree of injury sustained. Boron deficiency symptoms always appeared subsequent to a change from a complete to a boron deficient medium, regardless of the time during the growth cycle when such change was made, indicating that the plants cannot build up an available reserve of boron adequate to sustain continued normal growth. A continuous supply of boron is necessary.

"Microchemical studies suggest that boron is intimately involved in protein metabolism. Manganese deficiency symptoms are described for several species. These symptoms develop slowly, but are particularly serious during the reproductive and subsequent phases of development. The studies suggest that this element functions in the maintenance of the chlorophyll supply."

Researches on antibodies in plants [trans. title], D. CARBONE and A. V. ALEXANDRI (*Bol. Soc. Ital., Soc. Internaz. Microbiol.*, 7 (1935), *No. 6, pp. 221–224*).—This is a review, with 13 literature references.

Growth inhibition in the potato caused by a gas emanating from apples, O. H. ELMER (*Jour. Agr. Res. [U. S.], 52 (1936), No. 8, pp. 609–626, figs. 7*).—In studies by the Kansas Experiment Station, it was found that ripe apple fruits produce a volatile substance, low concentrations of which cause striking morphological and physiological abnormalities in the potato. Apical sprout growth of the affected potato practically ceases, but an abnormal radial growth develops. Epinasty occurs in affected leaves. Respiration and catalase intensities are approximately doubled, oxidase activity is increased, and striking changes occur in the nitrogen-carbohydrate balance of affected sprouts and tubers. The abnormal sprouts contained about one-third more of both total sugars and reducing sugars, but they contained only 57 percent as much protein-free nitrogen as do normal sprouts. The total sugar content of tubers which had been confined with apples for a month was five times that of the normal tubers.

Epinasty of potato leaves was caused both by the gas from apples and by ethylene, and the effects of ethylene on sprout production were indistinguishable from those produced by the growth-inhibiting gas from apples. Accelerated respiration resulted when potatoes were confined with apples, and a similar effect is produced by ethylene in certain other plants. The growth-inhibiting gas from apples was absorbed by bromine, fuming sulfuric acid, and chlorosulfonic acid. Analysis of the fuming sulfuric acid absorption products indicated that apple fruits produce ethylene.

Investigations on the root nodule bacteria of leguminous plants.—[XVIII], Continued investigations on the effect of air content of the medium on the development and function of the nodule, A. I. VIRTANEN and S. v[on] HAUSEN (*Jour. Agr. Sci. [England], 26 (1936), No. 2, pp. 281–287, fig. 1*).—Continuing these studies (E. S. R., 74, p. 700), in sterile water cultures inoculated peas grew well without added nitrogen if air was bubbled through the medium during growth. Abundant nodulation also occurred in nonaerated cultures, but the nodules were smaller and the plants grew poorly. Subsequent aeration of the latter induced distinct increases in nodule size and plant growth.

Nodulation was prevented by passing gaseous nitrogen through the medium. The necessity of oxygen for the nodule function was also indicated by the fact that peas grew excellently on added nitrogen in nonaerated cultures. Nitrogenous compounds were not excreted into the medium in inoculated water cultures, even with aeration and profuse growth.

In sand cultures where the sand was submerged in the nutrient solution profuse growth occurred when air was passed through the sand, and considerable amounts of nitrogen were excreted into the medium. It is therefore apparent that the roots and nodules must be in direct contact with solid materials for nitrogen excretion. This view is also supported by the facts that in cultures where only the root tips were embedded in the sand (their upper parts being exposed to the air) the plants grew excellently, but the rate of excretion was much lower than when the roots were entirely embedded in the sand.

Report on proposals submitted by R. E. Buchanan and by H. J. Conn relative to the conservation of Bacillus as a bacterial generic name, fixing of the type species and of the type or standard culture [Nomenclature Committee International Society for Microbiology], R. S. BREED and R. ST. JOHN-BROOKS (*Zentbl. Bakt. [etc.]. 2. Abt., 93 (1935), No. 24–26, pp. 481–490*).

How can the sliding together of paraffin sections be avoided? [trans. title] K. KLEIN (*Ztschr. Wiss. Mikros. u. Mikros. Tech., 52 (1935), No. 1, p. 52*).—By applying to the blade of the microtome knife a thin layer of paraffin harder than that of the embedded material the piling up of the cut sections was avoided, those down to 1μ in thickness being successfully made without deformation. It was necessary to renew this layer at about every fiftieth cut.

Staining with safranin and fast green FCF, J. A. MOORE (*Stain Technol., 11 (1936), No. 2, pp. 69, 70*).—Fast green FCF, an apparently permanent stain, when used with safranine gave a red xylem and a green differentiation of the other tissues, with a minimum of difficulty and a maximum of differentiation. Detailed procedure is given.

GENETICS

The combining ability of inbred lines of Golden Bantam sweet corn, I. J. JOHNSON and H. K. HAYES (*Jour. Amer. Soc. Agron., 28 (1936), No. 3, pp. 246–252*).—In a study of the relation between top cross yields and single cross yields between 11 inbred lines of Golden Bantam sweet corn, made at the Minnesota Experiment Station, inbred lines giving high yields in top crosses appeared more likely to produce the best single crosses than the inbred lines giving low yields in top crosses. The combining ability of inbred lines determined by top crosses and by several tester lines seemed of nearly equal value in isolating the best combining lines.

Results obtained in a study to determine the relationship between the yields of top crosses to the parental variety, Golden Bantam, to Del Maiz (unrelated variety), and to Del Maiz (inbred line), indicated that too few replications were used for accurate conclusions on the comparative desirability of the related and unrelated varieties as a test of combining ability of inbred lines, and also suggested the need for many replications, preferably at several locations, to determine accurately in a single year the combining ability of inbred lines by the use of the top cross test.

In a study of the relationship between characters of the Golden Bantam inbred lines and their yield in top crosses, made by means of simple and partial correlations, a few significant but not high correlations were obtained. Ear length and stalk diameter of the inbred lines tended to be associated positively with top cross yields and number of suckers per plant to be associated negatively with top cross yields. The yield of inbred lines was not significantly associated with combining ability in top crosses either in simple or partial correlations.

Cytological observations on certain Compositae, D. C. COOPER and K. L. MAHONY (*Amer. Jour. Bot., 22 (1935), No. 10, pp. 843–848, figs. 21*).—In this contribution from the Wisconsin Experiment Station, chromosome counts at meiosis in the microspore mother cells of 10 genera of Compositae are reported, and illustrations of the chromosomes are given for members of each genus.

The effect of carbohydrate and of nitrogen deficiency upon the male sex cells in the tomato, F. S. HOWLETT (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 448, 449*).—Cytological studies at the Ohio Experiment Station of chromosome behavior at the stages leading up to and including the formation of mature pollen grains in material taken from plants in which the carbohydrate and

nitrogen contents were altered by varying the photoperiod showed that, under extreme carbohydrate deficiency in late fall and winter plants, reduction divisions were not reached and the flowers abscised while very small. Under less severe conditions the flowers reached anthesis even though the locules contained only degenerated microspores or sterile pollen grains. With increasing carbohydrate contents an increasing proportion of microspores became functional. In vigorously vegetative plants grown in spring and summer and characterized by a condition of mild carbohydrate deficiency due to the abundant amino acid and protein formation, the flowers of the first two clusters showed an appreciable proportion of morphologically perfect but nongerminable pollen. Degeneration of microspores occurred at any stage following the second meiotic division.

As opposed to carbohydrate deficiency, plants with insufficient nitrogen displayed a decided regularity and stability in the development of male sex cells. Extreme nitrogen deficiency did result in some microspore degeneration and pollen sterility. The indication was that female organs and sex cells are relatively little affected by carbohydrate deficiency but are decidedly hindered in their development by nitrogen deficiency.

Inheritance of natural immunity in plants, with special reference to production of immune varieties by interspecific hybridization, D. KOSTOFF (*Sborn. Československ. Akad. Zeměděl.* (*Ann. Czechoslovak Acad. Agr.*), *10* (*1935*), *No. 4, pp. 389–402, figs. 7; Czechoslovak abs., pp. 389, 390*).—The author reviews present knowledge on the hereditary factors of disease immunity and susceptibility in plants, with special reference to wheat and based on the work of various investigators, including his own.

Of the three groups of wheat—*Triticum vulgare* with 42 somatic chromosomes, *T. durum* with 28, and *T. monococcum* with 14—the first is the most susceptible and the last the most resistant to various diseases. It has been impossible to transfer the immunity of the last group directly to members of the other two groups because of the sterility of the hybrids, but by crossing the hybrids *durum* group × *monococcum* group to the *vulgare* group partially fertile hybrids were produced containing the whole chromosome sets of all three groups. The chromosomes of *monococcum* conjugate completely or partially with those of the *vulgare* group, so that crossing over between *vulgare* and *monococcum* chromosomes may occur, which leads to the exchange of groups of genes and makes possible the transfer of *monococcum* characters on the background of *vulgare* representatives. *T. timopheevi* crosses with all other *Triticum* spp. and also with *Haynaldia villosum* and *Secale cereale*. If the immunity of *T. timopheevi* is localized in the conjugating chromosomes, the transfer of its immunity on the background of the other *Triticum* spp. becomes possible when the sterility is overcome. The chromosomes of *S. cereale* usually do not conjugate with those of *Triticum*, so that the transfer of its immunity to *Triticum* appears to be very difficult or even problematical.

The transmission of immunity following interspecific hybridization in vegetatively propagated plants is much easier, since fertility and homozygosis are not necessarily attributes of a clone.

The practical applications of recent advances in genetics and cytogenetics are further discussed in relation to the development of immune varieties of plants.

Chromosome behavior in blackberry-raspberry hybrids, S. H. YARNELL (*Jour. Agr. Res.* [*U. S.*], *52* (*1936*), *No. 5, pp. 385–396, fig. 1*).—Pointing out the fact that the genus *Rubus* in the United States is characterized by interspecific

compatibility, frequent lack of complete fertility, and a high degree of heterozygosity, the author presents the results of cytological studies at the Texas Experiment Station of crosses involving the amphidiploid hybrids of a dewberry × red raspberry with the diploid dewberry parent and with two diploid raspberries and a blackberry. Plants with diploid, triploid, and tetraploid chromosomes were found in the second generation of the dewberry backcross. A single diploid was of intermediate type, and 28 diploids strongly favored the dewberry type. The triploids were of two types, one plant favoring the Nessberry parent and three plants approaching the wild dewberry, but more vigorous. Seven disomes plus seven single chromosomes were found during the first division of the first triploid and from three to four trisomes (occasionally more) were distinguished in the second type.

Plants of the third generation of the Nessberry × Hailsham red raspberry cross and plants of the F_4 of the Nessberry × Early Harvest blackberry all had tetraploid chromosomes. This condition is believed due largely to the selection of plants favoring the Nessberry in the second and third generations. Meiosis of these plants was distinguished from that of the Nessberry by the frequent occurrence of multivalent association to give from one to as many as seven tetrasomes, and by considerably greater chromosomal irregularity during the reduction division. The author suggests that such association reflects genetic similarity among the associated chromosomes, since there had been an opportunity for more than two corresponding chromosomes of a genom to become segregated in a single plant.

A wide variation in vigor observed among the plants of these later generations is ascribed probably to genetic differences possible in the recombination of chromosomes from the three species involved. There was some correlation between chromosome regularity at meiosis and degree of fertility, but the most sterile plants did not exhibit a greater degree of irregularity than many of the less sterile.

Mutation in Trichothecium roseum [trans. title], T. PASSALACQUA (*R. Ist. Bot. Palermo Lav., 6 (1935), pp. 93–123, pls. 6*).—From a strain "A" of *T. roseum* (*Cephalotherium roseum*)—with the characteristic cultural, microscopical, and biological properties of the species but with a known tendency to fluctuation—there appeared, after a long series of monoconidial cultures, a strain "B" which differed in microscopical, macroscopical, biological, and saprophytic properties from the parent strain. In culture on the same medium the two strains could not be confused. To distinguish this mutation the author calls it *T. roseum* B.

[Genetic studies with livestock] (*Massachusetts Sta. Bul. 327 (1936), pp. 18, 19*).—Brief results are presented on studies of the inheritance of high milk production in the May Rose family of Guernsey cows, including breeding methods and amount of inbreeding practiced, by V. A. Rice; the occurrence of abnormal sperm in the semen of boars, by R. W. Phillips; and the development of the testes and scrotum of rams and bulls, including the effects of testicular hormone, and the determination of the speed of travel of spermatozoa in vitro and in the uteri of seven ewes slaughtered at intervals following artificial insemination, both by Phillips and F. N. Andrews.

[Animal breeding experiments by the Wisconsin Station] (*Wisconsin Sta. Bul. 435 (1936), pp. 33–35, 38, 39, figs. 2*).—Results are reported on the following investigations: The relation of interval between parturition and breeding to butterfat production, by A. B. Chapman and L. E. Casida; treatment of shy breeding cattle with pituitary hormone, by Casida; and progress in breeding fowls for lower adult mortality and high longevity and production, by J. G. Halpin and C. E. Holmes.

The Institute of Animal Breeding and Animal Genetics of Friedrich-Wilhelm University, Berlin [trans. title], C. KRONACHER (*Ztschr. Zücht., Reihe B, Tierzucht. u. Zuchtungsbiol., 33 (1935), No. 3, pp. 293–341, figs. 20*).—The facilities for conducting research in animal genetics are described, including the provisions for keeping numerous large animals.

Inheritance of irregularities in the vertebral column in cattle [trans. title], O. ROEMMELE (*Zuchtungskunde, 10 (1935), No. 12, pp. 449–452, figs. 5*).—Several cases of kinks in the tail or a small rudiment of the tail of cattle are described.

The status of genetic investigations with sheep [trans. title], J. KLIESCH (*Zuchtungskunde, 11 (1936), No. 3, pp. 81–99*).—A summary of sheep genetics.

Color factors for gray karakul down and the occurrence of hair the proximal half of which is black and the distal half white [trans. title], R. v. HILDPRANDT (*Ztschr. Zucht., Reihe B, Tierzucht. u. Zuchtungsbiol., 33 (1935), No. 2, pp. 249–254, figs. 5*).—Data are presented on the gray hair color of Karakul sheep, which was found to be due to a black and white banding of the hair similar to the condition occurring in agouti animals. The average length and thickness of the black and white bands is described.

The inheritance of a tendency toward twin production in the horse [trans. title], E. LAUPRECHT (*Züchtungskunde, 10 (1935), No. 12, pp. 433–448, figs. 5*).—A study of twins recorded in the Royal Trakehnan stud book in East Prussia pointed toward a single pair of recessive factors being responsible for the production of twins by a mare.

Inheritance of flatfoot in horses [trans. title], B. KALEFF (*Ztschr. Zucht., Reihe B, Tierzucht. u. Zuchtungsbiol., 33 (1935), No. 2, pp. 153–168, figs. 2*).—A study of the hoof characteristics of 76 horses listed in six stud books, some of which covered five generations, showed flat feet to be inherited as a simple factor recessive to the normal. Matings of heterozygous individuals (normal) produced 4 normals and 1 with flat feet. Only normal progeny (18) were produced when homozygous normals were mated with other types. Recessive × heterozygotes produced 8 normals and 7 with flat feet. Other characters frequently associated with flat feet were independently inherited.

Further data on linkage in rabbits, W. E. CASTLE (*Natl. Acad. Sci. Proc., 22 (1936), No. 4, pp. 222–225*).—The linkage between the two genes for rex (r_1 and r_2) (E. S. R., 71, p. 32) was determined by doubling the number of normal individuals among the 384 progeny produced from matings of doubly recessive males with doubly heterozygous females which in turn had been produced by crossing pure r_1 and pure r_2 individuals. The crossover percentage so calculated was 17.2±0.4 percent.

Data are presented on the linkage relations between the genes *C*, *Y*, and *B* for albinism, yellow fat, and brown pigmentation based on a total of 908 progeny produced by mating triple heterozygotes with triple recessives. These genes were shown to be in the order *C*, *Y*, *B*, with crossing over in females between *C* and *Y* of 14.4±0.8 percent, between *Y* and *B* of 28.4±1 percent, and in males between *C* and *Y* of 8.2±1.7 percent, and between *Y* and *B* of 26.6±2.8 percent. Crossing over in one region of the chromosome was evidently interfered with by crossing over in another region.

The Leporid problem [trans. title], H. NACHTSHEIM (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 33 (1935), No. 3, pp. 343–408, figs. 18*).—The differences between the wild rabbit and the field hare are tabulated, and in addition F_1, F_2, F_3, and F_4 crosses between Angora rabbits and field hares are described.

A three-factor linkage experiment in the mouse, H. GRÜNEBERG (*Jour. Genet., 31 (1935), No. 2, pp. 157–162, fig. 1*).—In a three-point linkage experiment at University College, London, involving the recessive factors, shaker, albinism, and pink eye in mice, females heterozygous for shaker, extreme dilution, and pink eye $\left(\frac{sh\ +\ p}{+\ c^p\ +}\right)$ were back-crossed with pink eyed, albino, shaker males. The 1,144 progeny were genotypically classified as follows: 464 pink-eyed shaker, 484 black-eyed white, 16 black-eyed white shaker, 18 pink-eyed, 85 black-eyed shaker, 75 pink-eyed white, and 2 pink-eyed white shaker. No wild type young were produced. The cross-over values of 3.1±0.52 percent between *sh* and *c* and 14.2±1.03 percent between *c* and *p*, compared with the larger amount of crossing-over between *sh* and *p*, suggested the order *sh*, *c*, and *p* for the genes in the chromosome. Some interference seemed to occur.

The influence of hereditary dwarfism on the differentiation of the skeleton of the mouse, A. B. DAWSON (*Anat. Rec., 61 (1935), No. 4, pp. 485–493, pl. 1*).—A study of skeletal formation in hereditary dwarf mice showed that bone growth was practically suppressed after the end of the second week of post-natal life, and the process of skeletal differentiation was greatly retarded. Skeletal differentiation in the dwarf mouse at from 6 to 8 mo. of age was comparable to that in normal litter mates at from 6 to 8 weeks of age.

Abnormal development in the mouse caused by chromosome unbalance, G. D. SNELL and D. I. PICKLES (*Jour. Genet., 31 (1935), No. 2, pp. 213–235, pls. 2, figs. 5*).—Morphological study of the abnormal embryos produced by the progeny of X-rayed males (E. S. R., 74, p. 327) showed that the neural groove had failed to close in its anterior end. None of the abnormal embryos were exactly alike in this characteristic. As such embryos were produced not only when both parents were sired by X-rayed males but also when such progeny were mated with normals, segregation of a simple recessive factor seemed to be eliminated. An X-ray-induced translocation which was contained in a small percentage of the gametes seemed a more likely cause. Probably some of the zygotes developed normally although carrying the translocation.

Crest and hernia in fowls due to a single gene without dominance, R. A. FISHER (*Science, 80 (1934), No. 2074, pp. 288, 289*).—The author's data suggest that crest and hernia in the fowl are due to the same gene.

A lethal mutation in Dark Cornish fowl, W. LANDAUER (*Jour. Genet., 31 (1935), No. 2, pp. 237–243, pl. 1*).—In inter se matings of Dark Cornish fowls at the [Connecticut] Storrs Experiment Station, 27 percent abnormal embryos were produced by some of the hens. The abnormality involving failure of the eggs to hatch caused shortened extremities and a short, broad head with bulging eyes. The production of the lethal character in back-cross matings sired by the Cornish males when crossbred with other breeds gave further proof of the recessive nature of the gene. Probably several dominant and recessive genetic factors are responsible for the shortness of the extremities frequently observed in Cornish fowls.

Studies of a new case of hereditary transmission involving pigmentary response in the plumage to ovarian hormone in a cross of domestic poultry [trans. title]. V. RÉGNIER (*Compt. Rend. Soc. Biol. [Paris], 118 (1935), No 9, pp. 848–850*).—F_1 males from the cross involving Indian Game ♂ × Brown Leghorn ♀ differ from females by having a darker color on the hackle and back. However, feminization of the males by ovarian grafts caused the lighter type plumage to appear comparable to that of the hybrid female. Small doses of folliculine benzoate were found to induce feathers of the female shape but black in color. It is suggested that perhaps the mode of response is genetic due to a factor transmitted by the Indian Game fowl.

Transactions on the dynamics of development (*Trudy Din. Razv.* [*Moskva*] (*Trans. Dyn. Devlpmt.*), *10 (1935), pp. 9–14, 17–22, 31–252, 269–298, 339–344, 361–374, figs. 33*).—The following papers in Russian, English, German, and French, or with abstracts in these languages, relating to genetics or the physiology of reproduction in animals are presented in this publication:

Foreword, dedicated to Professor M. M. Zavadovskiĭ (Zawadowsky), by N. I. Vavilov (pp. 9–14); Effects of a Deficiency in Vitamin A on the Male Sex Organs of the White Rat [trans. title], by P. Bouin (pp. 17–22); Thyroid Gland and a Deficiency of Vitamin B [trans. title], by L. Castaldi and E. Muntoni (pp. 31–33); Vitamins in the Female Sex Hormone [trans. title], by B. A. Kudrîashov (Kudrjashov) (pp. 35–41); The Anterior Lobe of the Hypophysis and the Development of the Gonads [trans. title], by M. Aron (pp. 43–48); The Seasonal Dimorphism in the Plumage of the Canard Duck [trans. title], by J. Benoit (pp. 49–57); Notes on Endocrinology of the Female Genitalia [trans. title], by R. Courrier and R. Kehl (pp. 59–65); The Effects of Daily Injections of Hehin on the Development of Sexual Characters in Leghorn Chicks, by L. V. Domm (pp. 67–80); Perforation of the Oviduct in the Domestic Fowl, by A. W. Greenwood (pp. 81–92); The Changes in the Reproductive Organs of the Rabbit During Pregnancy, by J. Hammond (pp. 93–115); Principles Controlling the Relation of the Sex Glands to Sex Differentiation in the Feathering of Domestic Birds [trans. title], by J. Krizenecky (pp. 117–136); Physiological Reaction in Sex Hormone [trans. title], by H. Kun (pp. 137–150); The Histological Processes in the Secretion and Resorption of Thyroid Colloids and Their Relation to the Annual Cycle in Some Birds [trans. title], by W. Küchler (pp. 151–160); Are the So-Called Sex Hormones, Extracted from the Urine, Specific, by Îa. M. Kavak (J. M. Kabak) and E. N. Emelianova (pp. 161–172); Are the Folliculin and the Yellow Body Hormone Equivalent When Preparing the Mammary Gland for Lactation, by Z. Š. Margulis (pp. 173–180); The Nervous Control of the Anterior Hypophysis, by T. Martins (pp. 181–187); Hormonal Mechanisms in the Control of Reproductive Phenomena, by C. R. Moore (pp. 189–203); The Assay of Sex Hormones, by A. S. Parkes (pp. 205–211); The Influence of the X-rays on the Sex Gland and the Secondary Sexual Characters in *Lebistes reticulatus*, by G. V. Samokhvalova (Ssamokhvalova) (pp. 213–229); On the Problem of Mutual Relation Between the Thyroid Gland and the Female Sexual System.—I. On the Mechanism of the Sterilizing Effect of Superfluous Thyreoidin on Pregnancy in White Rats, by S. I. Tereza (Teresa) (pp. 231–248); Regeneration of the Vesicular Gland in the Castrated Mouse [trans. title], by H. E. Voss (pp. 249–252); The Field Concept in Biology, by J. S. Huxley (pp. 269–293); A Case of Abortive Bovine Co-Twin Illustrating the Developmental Autonomy of the Skin and Hair Follicle, by F. A. E. Crew (pp. 295–298); Genetic Mosaics in the Feathers of the Common Fowl, by C. H. Danforth (pp. 339–344); and On a Cold Pigmentation of the Albino Iris and Retina as well as the Albino Hair, Isolated Cold Blacking of the Iris of a Pink-eyed Pure White [trans. title], by W. Schultz-Allenstein (pp. 361–374).

Studies on the physiology of reproduction in the sheep.—III, The time of ovulation and rate of sperm travel, W. W. Green and L. M. Winters (*Anat. Rec., 61 (1935), No. 4, pp. 457–469, pl. 1*).—Continuing these studies from the Minnesota Experiment Station (E. S. R., 73, p. 598), ovulation and the presence of sperm in portions of the reproductive tract at different intervals after mating were ascertained in 20 Shropshire ewes. The results indicate that ovulation occurs very late in the heat period, at the time the ewe is passing from heat. The life of the sheep sperm and ova appeared to be less

than 24 hr. Sperm reached the infundibulum approximately 5 hr. after copulation. The optimum time for mating the sheep was concluded to be during the last 5 or 6 hr. of the heat period.

On the early development of the mouse egg, W. H. LEWIS and E. S. WRIGHT (*Carnegie Inst. Wash. Pub. 459 (1935), pp. 113–144, pls. 6*).—Observations on the oestrous cycle, mating, and development of the embryos in 124 female mice are presented. Descriptions of some abnormal eggs are also given.

Sterility phenomena of Röntgen irradiation in the mouse [trans. title], P. HERTWIG (*Ztschr. Induktive Abstam. u. Vererbungslehre, 70 (1935), No. 3–4, pp. 517–523, figs. 4*).—Studies of the influence of X-rays on the genital region of male mice on the relative fertility, sterility, litter size, and sex ratio of the resulting progeny are reported. The histological condition of the testicles from irradiated animals is described.

Persistence of pituitary grafts in the testis of the mouse, W. U. GARDNER and R. T. HILL (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 8, pp. 1382–1384, figs. 2*).—The very satisfactory growth of pituitary grafts in the testicles of 11 of 13 mice is noted.

The crystalline ovarian follicular hormone, D. W. MACCORQUODALE, S. A. THAYER, and E. A. DOISY (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 7, p. 1182*).—In studies of the chemical nature of the crystalline ovarian follicular hormone the results indicate the identity of the hormone with dihydro-theelin.

Use of the female bitterling as a test for male hormone, I. S. KLEINER, A. I. WEISMAN, and D. I. MISHKIND (*Jour. Amer. Med. Assoc., 106 (1936), No. 19, pp. 1643, 1644*).—A simplified test for the male hormone, employing the elongation of the ovipositor of the female bitterling as the criterion of a positive reaction, is described. A small amount of the material to be tested is added to the aquarium water. The positive reaction is obtained in from 18 to 48 hr.

Physiology of the corpus luteum.—IX, The inhibition of oestrin by progestin-containing extracts of the corpus luteum, W. M. ALLEN and R. K. MEYER (*Anat. Rec., 61 (1935), No. 4, pp. 427–439, pl. 1*).—Continuing this series (E. S. R., 70, p. 607), the administration of corpus luteum extracts freed of oestrin but containing progestin, given in conjunction with cornifying amounts of oestrin to castrated mice, prevented both cornification and the oestrous smear. By increasing the doses of progestin, mucification identical to that of pregnancy was produced.

Physiology of the corpus luteum.—X, The comparative actions of crystalline progestin and crude progestin on uterine motility in unanesthetized rabbits, W. M. ALLEN and S. R. M REYNOLDS (*Amer. Jour. Obstet. and Gynecol., 30 (1935), No. 3, pp. 309–318, figs. 4*).—Continuing the above series, the purification, concentration, and crystallization of impure progestin resulted in an increased effect on endometrial proliferation and inhibition of uterine motility. It is concluded, therefore, that both effects are caused by the single hormone.

The action of oestrin on the mammary secretion, J. M. ROBSON (*Quart. Jour. Expt. Physiol., 24 (1935), No. 4, pp. 337–344, figs. 4*).—The administration of crystalline ketohydroxyoestrin to normal and ovariectomized lactating mice was found in studies at the University of Edinburgh to inhibit mammary secretion, which was restored when oestrin administration was stopped. Vaginal cornification was obtained in ovariectomized lactating animals as a result of the administration of doses of oestrin which had little or no effect on the vaginal smear of lactating normal animals.

Detection of mammotropin in the urine of lactating women, W. R. LYONS and E. PAGE (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 7, pp. 1049, 1050*).—A delicate test for the detection of mammotropin in the urine of lactating women

is described. After the extract has been prepared small doses are intradermally injected over the right and left crop sacs of squabs.

Estrogenic dihydroxy compounds in the urine of pregnant mares, O. WINTERSTEINER, E. SCHWENK, and B. WHITMAN (*Soc. Expt. Biol. and Med. Proc., 32 (1935). No. 7, pp. 1087, 1088*).—The occurrence of oestrogenic dihydroxy compounds in the urine of pregnant mares was demonstrated.

Morphologic and quantitative reaction of ant. pituitaries of castrated female rats to oestrin injections, J. M. WOLFE (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 7, pp. 1189–1191*).—Oestrin injections into over 100 ovariectomized female rats tended to completely or incompletely prevent the increase in number and size of the basophiles as well as of the eosinophiles ordinarily associated with castration, although some appeared in animals treated over 30 days.

Reaction of anterior pituitaries of mature female rats to injections of large amounts of oestrin, J. M. WOLFE (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 7, pp. 1192–1195*).—The daily administration of 200 rat units of oestrin for 12 days to 30 mature female rats greatly increased the weight of the pituitaries and resulted in a complete loss of the granules from all the basophiles, with a considerable enlargement of the nongranular basophiles.

Similar reactions were obtained by the administration of pregnancy urine extracts. In view of the fact that pregnancy urine extracts are capable of inducing the formation of oestrin in the ovary of the hypophysectomized rat, it is suggested that oestrin is the effective agent in inducing basophilic changes in the anterior lobes of female rats receiving extracts of pregnancy urine.

FIELD CROPS

[Crop production research in the Southern States] (*Assoc. South. Agr. Workers Proc., 34 (1933), pp. 55, 56, 58–60, 68–72, 73–76, 80, 81, 83–88, 114–116, 120, 121; 35 (1934), pp. 166–169, 188–191, 210–241, 262–265, 313–315, 326–328; 36 (1935), pp. 361–370, 375–380, 385–390, 398–410, 446–453, 455–476, 477–481, 508–510, 553, 554, 556–559, 581, 582, 590*).—Papers concerned with various agronomic problems and presented at the convention of the Association of Southern Agricultural Workers at New Orleans, La., February 1–3, 1933, by State experiment station, agricultural college, or U. S. Department of Agriculture workers, reported here as a rule in summary form, included Methods of Field Plot Investigation With Cotton Production Machinery, by J. W. Randolph (pp. 55, 56) (Ala., Miss., and U. S. D. A.); A Proposed System of Erosion Control, by H. D. Sexton and E. G. Diseker (pp. 58, 59) (Ala.); Field Observation Report of Soil Erosion Index Variants, by J. T. Copeland (pp. 59, 60) (Miss.); National Program of Plow Investigations, by R. B. Gray (pp. 63, 64) (U. S. D. A.); Some Recent Results of Cotton Ginning Investigations, by C. A. Bennett (pp. 64, 65) (U. S. D. A.); Abstract of Cooperative Fertilizer Placement Tests With Cotton in Seven States, 1932, by G. A. Cumings (pp. 66, 67) (U. S. D. A.); Obtaining the Standard Deviation of Experiments Covering a Series of Years, by C. K. McClelland (pp. 67, 68, 69) (Ark); Cotton Root Development in Certain South Louisiana Soils, by H. B. Brown (p. 68) (La.); Nitrogen Fixation by Soybeans, by W. B. Andrews (p. 70) (Miss.); Cropping Methods for Controlling Soil and Water Losses in Oklahoma, by N. E. Winters (p. 71) (Okla.); Oxidation-Reduction Capacity and Intensity in Water-Logged Soil, by M. B. Sturgis (pp. 71, 72) (La.); Phosphatic Fertilization for Rice Under Submerged Condition, by L. C. Kapp (pp. 73, 74) (Ark.); The Replaceable Potassium Content of Some Oklahoma Soils and Their Field Response to Potash Fertilization, by H. F. Murphy (pp. 74, 75) (Okla.); Twelve Year

Results With Nitrogenous Fertilizers on Cotton and Corn, by R. Kuykendall (pp. 75, 76) (Miss.); Nutrient Deficiency Symptoms in Certain Plants, by H. P. Cooper (pp. 80, 81) (S. C.); The Effect of Spacing on Certain Characters of Cotton When Grown Under South Louisiana Conditions, by J. R. Cotton (p. 83) (La.); The Comparative Effects of Light and Heavy Seed in Cotton, by H. W. Staten (p. 84) (Okla.); Growing Alfalfa on the Bench Land of Louisiana at Baton Rouge, by J. Gray (p. 85) (La.); Progress and Practical Use of the Cooperative Grade and Staple Work, by W. B. Lanham (pp. 86–88) (U. S. D. A.); Summer Annuals for Supplementing Permanent Pastures, by L. I. Case (p. 114) (N. C.); New Pasture Plant Introductions for the Southeast, by S. W. Greene (pp. 115, 116) (Miss.); and Pasture Fertilization Tests, by J. L. Fletcher and R. H. Lush (pp. 120, 121) (La.).

The following papers were presented at the convention held in Memphis, Tenn., January 31 and February 1 and 2, 1934: Operations of the Soil Erosion Service in Oklahoma, by N. E. Winters (pp. 166–169) (U. S. D. A.); The Possibilities of Foreign Cotton Production as Indicated by Conditions in Egypt and the Anglo-Egyptian Sudan, by P. K. Norris (pp. 188–191) (U. S. D. A.); How the Plow Works, by M. L. Nichols (pp. 210, 211) (Ala.); Field Curing of Hay as Influenced by Plant Physiological Reactions, by T. N. Jones and L. O. Palmer (pp. 211–214) (Miss.); Soil Crusts: Methods of Study, Their Strength, and a Method of Overcoming Their Injury to Cotton Stand, by A. Carnes (pp. 214, 215) (Ala.); Power Requirements in Cotton Ginning Plants, by V. L. Stedronsky (pp. 215–217) (U. S. D. A.); Recent Experimental Results With *Lespedeza sericea*, by H. P. Ogden (p. 218) (Tenn.); Ratio of Inorganic and Synthetic to Organic Nitrogen in Fertilizers for Cotton on Different Soil Types, by J. J. Skinner (p. 219) (U. S. D. A.); Fertilizer Placement Tests With Cotton, 1933, by G. A. Cumings (pp. 220, 221) (U. S. D. A.); Association Between Green Color of the Lint and Lint Percentage in Upland Cotton, by W. W. Hull (pp. 221, 222) (Miss.); The Nitrogen, Phosphorus, and Calcium Content of the Cotton Plant at Preblooming to Early Boll Stages of Growth, by H. F. Murphy (pp. 222–224) (Okla.); Lint Index, an Important Factor to Consider in Cotton Breeding, by N. Hancock (pp. 224, 225) (Tenn.); A Device for Separating Different Lengths of Fiber From Seed Cotton, by H. C. McNamara and R. T. Stutts (pp. 225, 226) (U. S. D. A.); Report on Cotton Spacing Tests for 1933, by L. L. Ligon (pp. 227–229) (Okla.); The Efficiency of Randomization and Analysis of Variance in Cotton Yield Trials, by O. A. Pope and J. O. Ware (pp. 229, 230) (Ark.); A Cotton Fibrograph, by K. L. Hertel (pp. 230, 231) (Tenn.); Breeding Wilt Resistant Varieties of Cotton, by J. O. Ware and V. H. Young (p. 232) (Ark.); Chaos in the Sorghum Kingdom, by C. K. McClelland (pp. 232, 233) (Ark.); The Growth of Prairie Grasses as Influenced by Rainfall and Temperature, by B. F. Kiltz (pp. 233, 234) (Okla.); Carbon Dioxide Production on Mannite Treated Soils as a Means of Determining Crop Response to Fertilizers, by W. B. Andrews (pp. 234–236) (Miss.); Studies on the Solubility of Iron and Phosphorus in Soils and in Chemical Precipitates as Affected by the Acidity of the Extracting Solution, by H. J. Harper and H. A. Daniel (pp. 236–238) (Okla.); The Influence of Different Soil Colloids on the Toxicity of Calcium Arsenate, by P. A. Gile (p. 239) (U. S. D. A.); Responses From Various Sources of Nitrogen, by W. R. Paden (pp. 239, 240) (S. C.); Fertilizer and Soil Reaction of Strawberry Soils, by R. A. Lineberry (pp. 240, 241) (U. S. D. A.); Effects of Calcium Arsenate on Rice, by A. H. Meyer (p. 241) (La.); The Value of Fertilizer on the Grazing Value of Permanent Pasture in the Piedmont, by E. C. Elting and J. P. LaMaster (pp. 262, 263) (S. C.); Temporary Grazing

Crops, by R. H. Lush and S. Stewart (pp. 263, 264) (La.); The Value of Fertilizing Carpet Grass Pastures, by L. I. Case (p. 265) (U. S. D. A.); Sweet Potato Propagation as Affected by Temperature and Character of the Bedded Roots, by R. A. McGinty and E. R. Miller (pp. 313–315) (Okla.); and Progress Report on Fertilizer Tests on Irish Potatoes, by E. F. Burk (pp. 326–328) (Okla.).

Papers presented at the convention held in Atlanta, Ga., January 30 and 31 and February 1, 1935, included: Facing the Soil Erosion Problem, by H. H. Bennett (pp. 361–366), A Land Use Program for the Cotton Belt, by H. R. Tolley (pp. 366–370), The World Cotton Outlook, by N. A. Olsen (pp. 375–380), Foreign Cotton Production, by L. Myers (pp. 385–390), A Coordinated Program of Cotton Plant Research, by H. W. Barre (pp. 398–400), Trends in the Quality of Cotton Consumed, by R. Whitaker (pp. 400–404), and Opportunities for Improving the Quality of Cotton, by J. O. Ware (pp. 405, 406) (all U. S. D. A.); History and Progress of the One-Variety Community Cotton Work in Georgia, by R. P. Bledsoe and E. C. Westbrook (pp. 407–410) (Ga.); Gully Control in the Southeast, by J. T. McAlister (pp. 446, 447) (U. S. D. A.); Grades of Fertilizers for Corn and Cotton, by J. W. Tidmore (p. 448) (Ala.); Fertilizer Reaction, Soil Amendments, and Crop Production, by J. J. Skinner and H. B. Mann (pp. 449, 450) (U. S. D. A. and N. C.); The Relation Between Soil Types and Crop Yields, by R. P. Bartholomew (p. 450) (Ark.); The Results of Five Years' Fertilizer Tests on Pasture Grass Plots at Gainesville, Florida (pp. 451, 452), The Effect of Nitrogen Fertilization and Frequency of Clipping on Pasture Grass Yield and Composition (pp. 456, 457), and Comparison of Various Southern Pasture Grasses for Grazing Purposes (pp. 464–466), all by G. E. Ritchey (U. S. D. A. and Fla.); Fertilizer Placement Experiments in 1934, by G. A. Cumings and J. J. Skinner (p. 453) (U. S. D. A.); A Comparison of Native and Improved Pastures, by W. E. Stokes and A. L. Shealy (pp. 455, 456) (Fla.); Effect of Certain Environmental Factors on Development of Cotton Seed, Germinating Ability, and Resultant Yield of Cotton, by W. A. Carver (pp. 457, 458) (Fla.); Lespedezas in Louisiana, by J. Gray (pp. 458, 459) (La.); Effect of Variety, Maturity, and Soundness on Certain Soybean Seed and Oil Characteristics, by J. F. O'Kelly and M. Gieger (p. 460) (Miss.); Notes on Boll Weevil-Resistant Characters of Cotton, by E. W. Dunnam (pp. 461, 462) (U. S. D. A.); Effect of the Water Supply During Various Stages of Boll Development on the Distribution of the Length Groups of Cotton Fibers as Shown by the Sorter Method, by G. M. Armstrong and C. C. Bennett (pp. 462, 463) (S. C.); Fundamentals of Pasture Research, by W. A. Leukel (pp. 463, 464) (Fla.); Cotton Culture in the United States, by H. B. Brown (pp. 466, 467) (La.); The Value of Outfield Experiments in Louisiana, by J. R. Cotton (p. 467) (La.); Peanut Breeding at the Florida Experiment Station, by F. H. Hull (pp. 468, 469) (Fla.); Application of the Fibrograph to Fiber-Length Analysis of Lint Cotton, by K. L. Hertel (pp. 469, 470) (Tenn.) (see page 572); Efficiency of Superphosphate for Cotton, by J. T. Williamson (pp. 470, 471) (Ala.); Soil Acidity and Liming and Fertilizer Recommendations for Various Crops, by H. P. Cooper (pp. 471–473) (S. C.); Relation of Fertilizer Treatments to the Mineral Nutrients in Sap and Tissue of the Cotton Plant, by W. R. Paden (pp. 473, 474) (S. C.); The Soluble and Available Nutrients in the Profile of a Cropped Soil of Louisiana, by H. C. Lovett (p. 475) (La.); Certain Soil Deficiencies and Their Correction, by R. M. Barnette (pp. 475, 476) (Fla.); Method of Reducing the Retail Cost of Cotton Fertilizers, by W. H. Ross and A. L. Mehring (pp. 477, 478) (U. S. D. A.); A Useful Chart for Teaching the Relation of Soil Reaction to the Availability of Plant

Nutrients to Crops, by N. A. Pettinger (pp. 478, 479) (Va.); Soil Erosion Experiments, by W. O. Collins (pp. 479, 480) (Ga.); Solonetz B Horizon Mixtures for Terrace Building, by H. F. Murphy (p. 481) (Okla.); Five Year Results on Monthly Clipping of Pastures, by R. H. Lush (pp. 508, 509) (La.); Sandhill Grazing Problems, by E. W. Faires (pp. 509, 510) (S. C.); Effect of Size on the Food Reserves in Irish Potato Seed Pieces at Intervals During the Growing Season, by W. D. Kimbrough (p. 553) (La.); The Irish Potato Improvement Program in North Carolina, by M. E. Gardner (pp. 553, 554) (N. C.); The Influence of Seed Size Upon the Sprout Production of the Nancy Hall Sweet Potato, by J. B. Edmond (pp. 556, 557) (Miss.); Regular Slip Pulling Versus Ordinary Slip Pulling in Sweet Potato, by T. E. Ashley (pp. 557, 558) (Miss.); Practices of Sweet Potato Growers in Jones County, Mississippi, by W. S. Anderson and J. B. Edmond (pp. 558, 559) (Miss.); Effect of Certain Environmental Factors on the Germination of Florida Cigar-Wrapper Tobacco Seeds, by R. R. Kincaid (pp. 581, 582) (Fla.); and Wilt Resistant Cottons Adapted to the Gulf Coastal Plains, by D. C. Neal (p. 590) (U. S. D. A.).

[Crops experiments at the North Louisiana Substation] (*Louisiana Sta., North Louisiana Sta. Rpt. 1935, pp. 3–19, 20, 21*).—Average results are reported briefly from experiments during several years with field crops (E. S. R., 67, p. 123), including variety tests with cotton, corn, oats, soybeans, sugarcane, sorgo, and sweetpotatoes; fertilizer trials with cotton, corn, oats, and sorgo; seedbed preparation, planting, and spacing tests with cotton and corn; comparisons of winter cover crops for cotton and corn; corn variously spaced and interplanted with soybeans; a grazing trial with sweetpotatoes and effects on yields; manured rotations; and production tests with crotalaria varieties and alfalfa.

[Agronomic experiments in Massachusetts], W. S. Eisenmenger, M. E. Snell, R. W. Donaldson, E. F. Gaskill, J. Everson, A. I. Bourne, L. S. Dickinson, W. H. Sawyer, and H. J. Franklin (*Massachusetts Sta. Bul. 327 (1936), pp. 9–11, 12, 13, 52, 53*).—Research with field crops again reported on briefly (E. S. R., 73, p. 601) comprised variety trials with potatoes; fertilizer experiments for pastures; a test of an herbicide on chickweeds in fine turf grasses; and control of cranberry bog weeds. Tobacco experiments dealt with cropping systems, nitrogen carriers, proportion of organic: inorganic nitrogen in the fertilizer, methods of applying fertilizers, and distribution of nitrogen in soils mixed with different plant tissues and allowed to react for 2 mo.

[Agronomic studies in New Hampshire] (*New Hampshire Sta. Bul. 289 (1936), pp. 10–12, 13*).—Field crops research reviewed briefly and variously participated in by F. S. Prince, P. T. Blood, T. G. Phillips, G. P. Percival, and L. J. Higgins included experiments with hay and with legumes on neglected hay lands; a dairy farm rotation on worn-out hay lands; potatoes in a 3-yr. fertilized rotation; the effect of aluminum sulfate and sulfur on the control of scab on potatoes; a fertilizer experiment with legumes in the Connecticut Valley; a time of cutting hay test; and a nitrogen top-dressing experiment for grass hay.

[Field crops investigations in North Dakota, 1932–35], H. L. Walster, T. E. Stoa, L. R. Waldron, P. J. Olson, H. C. Hanson, O. A. Stevens, H. L. Bolley, C. E. Mangels, T. H. Hopper, L. L. Nesbitt, and A. J. Pinckney (*North Dakota Sta. Bul. 286 (1935), pp. 7–12, 28–34, 39, 40, 42, 43–47, 86–95, figs. 3*).—Continued agronomic research (E. S. R., 67, p. 667) reported on from the station and substations included breeding work with wheat, corn, alfalfa, and seed flax for disease resistance and oil production; variety tests with wheat, barley, corn, oats, seed flax, alfalfa, and sweetclover; cereal studies concerned

with color of durum wheats, the bromate modification of the baking test, blending wheat varieties from different localities, the effect of blending hard red spring flours with a low-protein soft wheat flour, the Cutler-Pehlshenke wheat meal fermentation time test for varieties, and diastatic activity in flours as affected by variety, location, and fertilizer; the effect of combine harvesting on the quality of wheat; flax investigations concerned with factors influencing the quantity and quality of oil in flaxseed, variations in protein content of commercial linseed meals, the oil content of the seed and iodine number of oil from recent commercial flaxseed, and the rate of deposition and desaturation of linseed oil in flaxseed during seed development; studies of phosphorus deficiency in barley varieties and alfalfa and prairie hay, the losses of dry cured grasses by weathering, and the chemical composition of sorgo, Sudan grass, and milo varieties; studies of growth, reproduction, and control of leafy spurge; life histories of annual weeds; a study of the germination of wild oats; and seed studies concerned with the viability of dehulled seeds and the proportion of broken grains in flax and wheat. Certain lines of work were in cooperation with the U. S. Department of Agriculture.

[Field crops research in Wisconsin, 1934–35] (*Wisconsin Sta. Bul. 435 (1936), pp. 2–20, figs. 5*).—Progress reports of agronomic investigations (E. S. R., 74, p. 477) included in these pages are concerned with the merits of seed from hybrid corn for planting, by N. P. Neal; injury to germination of corn by cold of 12° F., by A. M. Strommen and E. J. Delwiche; determination of corn maturity belts in the State; variety tests with grain sorghum, sorgo, and millet, breeding work with sorgo, and surveys of hemp and hop production, all by A. H. Wright; efforts to select a Sudan grass line low in prussic acid content, by H. L. Ahlgren, O. S. Aamodt, and Wright; harvesting and threshing tests with reed canary grass seed, and cultural and utilization studies with lespedeza, by E. D. Holden; tests of lespedeza in mixtures on grub-eaten hillside pastures, by Holden, L. F. Graber, and Ahlgren; a test of crops for winter game-bird feeding, by A. Leopold and G. Briggs; variety and breeding work with soybeans for seed, forage, and culinary value, by Briggs; determinations of the salts lost by winter-injured alfalfa roots, by V. G. Sprague, Graber, and W. E. Tottingham; trials on permanent Kentucky bluegrass pasture to measure yields as influenced by various cutting and fertility treatments, the effect of fertilizer treatments on the chemical composition of grass from the viewpoint of nutritive value, and the seasonal recovery of nitrogen, by G. B. Mortimer and Ahlgren; the effect on yield of cutting bluegrass at various growth stages, by Ahlgren; improvement of pastures in southwestern Wisconsin, by Mortimer, Ahlgren, and E. J. Graul; rotational grazing of pastures, by Mortimer, Ahlgren, Aamodt, and I. W. Rupel; and a study of the possibilities of legumes in renovating grub-injured pastures, by Graber. Certain experiments were in cooperation with the U. S. Department of Agriculture.

Are uniformity trials useful? H. H. Love (*Jour. Amer. Soc. Agron., 28 (1936), No. 3, pp. 234–245*).—From a critical examination at the New York Cornell Experiment Station of data from a number of reported uniformity trials, the author believes that "our present stand should be that of seeking further information rather than to conclude either that the method will always lead to greater precision or that the system of preliminary cropping will be of little value. Certainly for indicating those parts of a field that should not be used for experiment and for suggesting a better lay-out preliminary cropping will be useful, and for some fields and crops at least the data from preliminary cropping will lead to greater precision."

[Regional land use] (*Jour. Amer. Soc. Agron., 28 (1936), No. 3, pp. 165–201, figs. 5*).—The symposium on regional land use presented at the meeting of the American Society of Agronomy in Chicago, December 5 and 6, 1935, included Regional Land Use for the Hard Red Winter Wheat Belt, by R. I. Throckmorton (pp. 165–172); Some Problems of Land Use in the Corn Belt, by P. E. Brown (pp. 173–192); and Cultural Methods of Controlling Wind Erosion, by L. E. Call (pp. 193–201).

Nitrogen and organic carbon of soils as affected by crops and cropping systems, W. H. METZGER (*Jour. Amer. Soc. Agron., 28 (1936), No. 3, pp. 228–233, fig. 1*).—Studies were conducted at the Kansas Experiment Station to determine the effect on the soil nitrogen and organic carbon of wheat continuous, alfalfa continuous, a 3-yr. rotation of corn, cowpeas (or soybeans), and wheat, and a 16-yr. rotation in which alfalfa is grown for 4 yr. and a 3-yr. rotation of corn, wheat, and wheat takes up the remaining 12 yr.

Corn seemed much more destructive of nitrogen and carbon than any other crop or cropping system. Both alfalfa and cowpeas apparently added to the soil's nitrogen supply, but cowpeas were more destructive of carbon than alfalfa. Continuous wheat produced about the same effect as each of the two rotations. The total crop production over a period of 25 yr. and total nitrogen of the soil were highly and positively correlated. Manuring failed to produce significant increases of nitrogen or carbon attributable directly to manure and not to increased crop residues. The nitrogen of the soil of the plats studied appeared definitely to be approaching an equilibrium characteristic of the crop or cropping system employed.

Management of bent grass lawns, J. TYSON (*Michigan Sta. Circ. 156 (1936), pp. 18, figs. 6*).—This informative circular discusses varieties, soils and their preparation, soil reaction and liming, planting methods, fertilizers, maintenance of lawns, care of shady lawns, and control of weeds and turf diseases.

The relation of physical properties and chemical composition of red clover plants to winterhardiness, G. A. GREATHOUSE and N. W. STUART (*Maryland Sta. Bul. 391 (1936), pp. 465–492, figs. 4*).—This study of the physical properties and chemical composition of roots and shoots of a foreign (French) and of a domestic (Ohio) red clover at intervals throughout a year supplements research on various physical and chemical changes which take place in red clover roots in the cold-hardened condition (E. S. R., 73, p. 35).

Comparison of the properties of the winter hardy domestic and the less hardy foreign varieties indicated that adaptability to cold is associated with a larger unfreezable ⇄ freezable water ratio and osmotic pressure value, a slightly higher pH value, greater concentrations of total sugars, dextrins, starch, and total and nonprotein nitrogen, and lower moisture content and specific conductance value. The other determined carbohydrates, as pectin, pentosans, and hemicellulose, as well as the proteins and ash, often were greater in the nonadaptable clover. The data indicated that the adaptability of the red clover plant to winter conditions is associated closely with its metabolic rate. The importance of studying the physical and chemical properties of the root and shoot during active growth stages as well as in the winter periods is evident.

Report on agronomic phases of field corn varietal experiments in 1935, L. H. PATCH (*U. S. Dept. Agr., Bur. Ent. and Plant Quar. 1935 pp. [10]*).—The yields and other agronomic data reported for a number of varieties and single and double crosses of corn were obtained incidentally in connection with research on the European corn borer, conducted from the Toledo, Ohio, laboratory.

Minnesota corn hybrids, I. J. JOHNSON, C. W. DOXTATOR, H. K. HAYES, and R. F. CRIM (*Minnesota Sta. Bul. 326 (1936), pp. 23, figs. 9*).—Corn hybrids distributed by the station and described with data on their yields and other agronomic characters include the field corn double crosses, Minhybrids 401 and 402, and the three-way cross, Minhybrid 301; the sweet corn crosses, Minhybrids 201, 202, and 203 (Golden Bantam), Minhybrid 204 (Crosby), Minhybrid 205 (Country Gentleman); and the popcorn cross, Minhybrid 250 (Japanese Hull-less). Remarks are made on pollination, effects of inbreeding corn, kinds of corn hybrids, and the future use of hybrid corn. See also an earlier note (E. S. R., 65, p. 131).

Positions of seeds and motes in locks and lengths of cotton fibers from bolls borne at different positions on plants at Greenville, Tex., D. D. PORTER (*U. S. Dept. Agr., Tech Bul. 509 (1936), pp. 14, pls. 4, figs. 2*).—Single open bolls were taken from the lower (early), middle (mid-season), and upper (late) fruiting positions of each of 10 normal well-grown plants of 10 varieties and strains of cotton from each of the 1931, 1932, and 1933 crops at Greenville, Tex., making a total of 900 bolls available for study of the number of motes (abortive seeds) in different varieties, their positions in the locks, number of mature seeds in locks, length of fibers on motes and on seeds, and the possible correlation of number of mature seeds in locks and lint length. Most of the varieties have been widely grown in Texas.

It was found that reduction of the number of mature seeds per lock from the total number of ovules in the carpel is inversely proportional to the increase in number of motes. Since about one-third of the motes found in these studies were at the base of the lock, and the remainder in decreasing numbers toward the apex, the causes of abortion apparently are more active near the base.

Although the mean length of lint for each variety fluctuated from season to season, an increase in mean length was recorded from early- to late-season bolls for 9 of the 10 cottons. In a single lock the seed with the longest fibers can occur at any position in the lock. Evidence from the total population of 900 locks indicated that as a rule the shortest fibers occur on seeds at the apex of the lock, longer fibers on seeds at the base, and the longest fibers on seeds in the central portion. While variation occurred within these varieties from year to year, locks of cotton with few seeds definitely tended to produce longer fibers than were produced by locks having many mature seeds. The actual cause of the tendency to production of longer fiber in locks with fewer seeds seemed to be a nutritional one.

Development and use of standards for grade, color, and character of American cotton linters, G. S. MELOY (*U. S. Dept. Agr., Misc. Pub. 242 (1936), pp. 12*).—This is a revision of and supersedes Miscellaneous Publication No. 10, The Establishment of Standard Grades for American Cotton Linters (E. S. R., 58, p. 634).

Analysis of Crotalaria juncea with special reference to its use in green manuring and fibre production, B. N. and S. N. SINGH (*Jour. Amer. Soc. Agron., 28 (1936), No. 3, pp. 216–227, figs. 2*).—*C. juncea* was analyzed at Benares Hindu University to determine its organic and inorganic constituents at successive stages of its life cycle, and growth studies were also conducted.

The percentages of organic matter, nitrogen, and other essential elements in general increased with the age of the plant, and attained a maximum late in the adolescent stage (60 to 75 days) both in the entire plant and various parts. The absolute quantities of these materials for the entire plant and amounts calculated on an acre basis attained maximum values when the plant

was in partial senescence (90 days), while the maximum was attained for different parts, especially the leaves and roots, only when the reproductive phase (75 days) began. The leaves were found to have the highest fertilizer efficiency, followed by the roots and stems in order. The fiber content, as judged by the percentage of celluloses, is highest when the plant is senescent, but the best quality of fiber can only be had when in the adolescent stage.

Evidently, the best period for green manuring would be at about the end of the adolescent stage and when reproduction commences. If both green manure and fiber are desired, the leaves, tops, and roots could be plowed under with advantage and the stem used for fiber when the plant is 75 days old without markedly affecting soil fertility.

Relative vigor of apical and basal seed pieces of potato, P. M. LOMBARD and W. STUART (*Amer. Potato Jour., 13 (1936), No. 5, pp. 124–130*).—Experiments made by the U. S. D. A. Bureau of Plant Industry near Presque Isle, Maine, 1931–34, inclusive, involving both Irish Cobbler and Green Mountain potatoes, furnished data which when subjected to analysis of variance led to the conclusion that sets near the basal end of the tuber will give yields equal to those produced by sets taken from the region near the bud-eye cluster.

Potato growing in Florida, W. M. FIFIELD (*Florida Sta. Bul. 295 (1936), pp. 48, figs. 12*).—The practical information presented, based extensively on results of station research as well as experience, considers the economic importance of the crop, production areas in Florida, environmental factors affecting potato production, soils, varieties and seed, seed preparation, cultural methods and field practices, spraying and dusting, harvesting, grading and packing, and marketing.

Resistance of sorghum to stem borers, T. S. HSU (*Jour. Amer. Soc. Agron., 28 (1936), No. 4, pp. 271–278*).—Varietal differences as to the amount of infestation of stem borers such as *Pyrausta nubilalis* and *Diatraea diatraea* were observed in extensive studies of sorghum varieties and strains grown at the Crop Improvement Station of Yenching University at Peiping, China. Under controlled conditions, sorgos as a group were more susceptible than the nonsaccharine varieties. Host selection of the "laying" moths seemed a possible cause for the varying degrees of infestation in different varieties. The degree of infestation by borers probably is a heritable character since the correlation between 1933 and 1934 infestation was significantly high. Borer infestation was found to be consistently associated with color of grain and plant height. White grain varieties showed less infestation by borers than varieties with other grain colors.

New sugar-beet varieties for the curly-top area (*U. S. Dept. Agr. Circ. 391 (1936), pp. 5, fig. 1*).—U. S. 33 and U. S. 34, new sugar beet varieties described as more resistant to curly top than the parent variety U. S. No. 1 (E. S. R., 69, p. 818) which they are expected to replace, are considered suitable for areas exposed to curly top in several western States. Since they tend to develop seed stalks prematurely, their use in California will be restricted to the later plantings in areas exposed to curly top. The merits of another curly-top-resistant variety known as No. 600, are also pointed out.

Investigations relative to the breeding of coumarin-free sweet clover, Melilotus, T. M. STEVENSON and J. S. CLAYTON (*Canad. Jour. Res., 14 (1936), No. 4, Sect. C, pp. 153–165, figs. 3*).—In a series of studies upon the coumarin content of various species, varieties, and individual plants of sweetclover grown at Saskatoon, Sask., determinations were made upon different plant parts, at different stages of growth, and upon herbage dried by different methods. The coumarin content of the leaf and stem of sweetclover changes rapidly through-

out the various stages of growth. Wide variations in coumarin content were found to exist between different species, between different varieties within a species, and often between individuals within a variety. A marked relation was noted between color of leaf and coumarin content, plants with dark-colored foliage invariably testing higher in coumarin content than those with lighter foliage. Alpha possessed a lower coumarin content than any other variety of *M. alba* tested. *M. dentata* contained less than 0.01 percent of coumarin in the foliage and less than 0.05 percent in the mature seeds. Air drying or oven drying resulted in a heavy loss of coumarin from sweetclover leaves and marked changes in the coumarin content of the stems. The coumarin contents of the leaf and of the mature seed were definitely correlated in the materials used, the coumarin content of the mature seed providing a reliable estimate of the coumarin content of the leaf. Breeding results indicated the possibility of producing low coumarin varieties through inbreeding and selection.

The influence of the awn upon the development of the kernel of wheat, C. E. ROSENQUIST (*Jour. Amer. Soc. Agron., 28 (1936), No. 4, pp. 284–288*).—The kernels from awned florets averaged about 1.4 percent heavier than those from awnless florets in the same spike of F_2 of Garnet × Prelude wheat. Kernels from intermediately awned F_2 spikes averaged 3.2 percent heavier than those from awnless F_2 spikes, while kernels from fully awned F_2 spikes were 4.9 percent heavier. The presence of awns on the florets of wheat tended toward the production of heavier kernels.

In preliminary studies, kernels from clipped spikes weighed only 82.7 percent as much as those from similar awned spikes; from clipped spikelets 85.1 percent as much as from normal spikelets on the same spike; and kernels from spikes with outer glumes removed 92.1 percent as much as those from normal spikes.

Influence of temperature and other factors on the morphology of the wheat seedling, J. W. TAYLOR and M. A. MCCALL (*Jour. Agr. Res. [U. S.], 52 (1936), No. 8, pp. 557–568, figs. 8*).—The temperatures of 24° and 20° C. increased the length of the coleoptile and subcrown internodes of seedlings of Hard Federation and Turkey wheats as compared with 16° and 12°. Deep planting (45 mm) was more effective, however, than temperature in elongating the coleoptile. In all comparisons Hard Federation had longer coleoptile and subcrown internodes than Turkey.

Coleoptile tillering seldom occurred at 24° or 20°, while at 16° about half of the Turkey plants tillered from the coleoptile node and at 12° the percentage rose to more than 80. Hard Federation did not develop over 4 percent of coleoptile tillers at any temperature. Turkey, a variety often injured by heaving, was slower in developing crown roots at 16° and 12° than Hard Federation. Larger seed and well-matured seed increased the number of seminal roots. Seminal roots were much fewer with deep (75 mm) than with shallow planting (20 mm).

Crown and root development in wheat varieties, R. B. WEBB and D. E. STEPHENS (*Jour. Agr. Res. [U. S.], 52 (1936), No. 8, pp. 569–583, figs. 3*).—Several factors determining crown and root development in wheat varieties were studied at Moro and Corvallis, Oreg., by the U. S. D. A. Bureau of Plant Industry working in cooperation with the Oregon Experiment Station. The significance of these factors is considered in relation to cultural practices in wheat growing in the Columbia River Basin.

The depth below the surface of the soil at which the crown is formed in wheat plants is influenced by variety, environment (especially temperature),

and planting depth. The wheat varieties studied differed greatly in the depth at which the crown was formed. Winter varieties formed crowns deeper than those of spring varieties and, in general, the hardy winter varieties formed crowns deeper than those of the nonhardy winter varieties. Low temperatures between planting and emergence caused the plants to crown deeper than when high temperatures prevailed. Deeper planting caused the crowns to be formed somewhat deeper but not in proportion to the difference in planting depth. Wheat varieties also differed in the time at which crown roots developed.

Thatcher wheat, H. K. HAYES, E. R. AUSEMUS, E. C. STAKMAN, C. H. BAILEY, H. K. WILSON, R. H. BAMBERG, M. C. MARKLEY, R. F. CRIM, and M. N. LEVINE (*Minnesota Sta. Bul. 325 (1936), pp. 39, figs. 10*).—Thatcher (E. S. R., 71, p. 576) is a hard, red spring wheat resembling Marquis but having a slightly shorter and more compact spike, maturing a day or two earlier than Marquis under comparable conditions, and surpassing all varieties compared therewith in ability to withstand lodging. It is a selection from a double cross of (Iumillo × Marquis) × (Kanred × Marquis), derived in cooperation with the U. S. Department of Agriculture. It combines field resistance to stem rust from heading to maturity inherited from the Iumillo parent with immunity from several forms of rust in both the seedling and mature plant stage obtained from the Kanred parent.

In yield trials at the station and at several substations, 1929–35, Thatcher was outstanding in yielding ability in seasons when stem rust infection caused severe shriveling of the seed of susceptible varieties, and it yielded well also when rust was not a factor. It produces somewhat smaller kernels, on the average, than either Ceres or Marquis. When conditions favor all varieties, the weight per bushel of Thatcher is slightly below that of Marquis or Ceres, but it greatly surpasses them in bushel weight when rust is prevalent. Thatcher is susceptible to leaf rust; gives about the same percentage of bunt as Marquis in trials at University Farm, being distinctly superior to Ceres and Reward; and is resistant to black chaff.

Milling and baking tests from 1929 to 1932, inclusive, from grain harvested in the varietal plats in four localities showed Thatcher to be outstanding in most respects, on the average equaling or surpassing Marquis and Ceres in crude protein percentage, flour percentage, loaf volume, crumb texture, grain of crumb, and crumb color score. Thatcher appeared to be no more variable in these characters than these standard high-quality spring wheats.

In 69 demonstration trials in 1935 in 21 counties in the spring wheat area of Minnesota, Thatcher gave good yields and had little rust infection under conditions under which Ceres and Marquis were severely injured. It was somewhat more resistant than Marquillo, which also excelled Ceres and Marquis in yielding ability and rust resistance under the rust epidemic conditions of 1935.

The influence of climate, soil, and fertilizers upon quality of soft winter wheat, E. G. BAYFIELD (*Ohio Sta. Bul. 563 (1936), pp. 77, pl. 1, figs. 3*).—The effects of several environmental factors, i. e., climate and soil type, fertility, and reaction, influencing the quality of soft winter wheat during the 5-yr. period 1929–33, were studied in cooperation with the Tri-State Soft Winter Wheat Improvement Association, the Ohio State University, and the Indiana and Michigan Experiment Stations with the objective of eliminating undesirable varieties and of fostering desirable varieties in the various sections of the three States so that maximum benefit will accrue to the grower, miller, and consumer. See also previous notes (E. S. R., 68, p. 42; 73, p. 472).

Climate was found to exert the largest influence upon wheat strength and quality. Its effects were determined indirectly from winter wheat abandonment acreage data and directly from 5-day averages for mean daily temperatures and precipitation during the 50-day period before harvest. Areas of heavy abandonment produced stronger wheat than sections with less winter injury. Acreage abandoned was associated with soil areas. Temperature apparently acted only as a modifying factor upon precipitation, for, during the 50-day period studied, it produced much less effect than rainfall. Rainfall influenced the amount of protein in wheat when it occurred during a 10- to 15-day interval during and just before the heading period. Precipitation at this time was associated with a decrease in protein. While climate obviously can not be controlled, its effect may be modified somewhat by certain practices.

Soil was found to exert almost as much influence as climate upon wheat protein content and was used as a basis for zoning the Tri-State area for wheat strength. Heavy soil texture was associated with increased percentages of wheat protein. It also appeared as though a wider annual range in protein might be expected from heavy soil areas than from sections with medium-textured soils. The color of soil gives a general idea of its probable fertility; darker and more fertile soils gave increased amounts of protein. Soil origin and age were also considered in the outlining of the zonation program, since soils derived from limestone produced wheat tending toward a higher protein content than soils derived from noncalcareous sandstone and shale. Very old soils are less fertile than younger (geologically) soils and may be expected to give low-protein wheat, except when the yields are low or the test weight is abnormal.

The supply of available soil nutrients, probably the most important soil factor regulating the amount of protein, is influenced by climate and by type and texture of soil. Both the total amount and the composition of this nutrient supply influence the quantity and quality of protein and, in turn, are affected by soil type and by soil texture, as well as by fertilizer practices and climate. A proper balance between the several elements in the nutrient supply is needed for the desired quality of grain. Certain of the treatments included in the fertilizer studies produced wheats which illustrated how poorly balanced fertilizer applications would produce grain of undesirable strength or poor test weight. Of the three nutrient elements investigated, nitrogen increased and phosphorus decreased protein content, and potassium was intermediate in effect.

Test weight per bushel was increased by phosphate fertilizers in both the 5-yr. rotation experiment (E. S. R., 53, p. 217) and the legume-reaction experiment (E. S. R., 74, p. 314). Lime in the 5-yr. rotation decreased test weight in 8 of 10 yr., but increased it in the 2 yr. of the legume-reaction experiment. Test weight may increase with either increasing or decreasing protein content; the former occurs when normal well-filled kernels have increasing amounts of protein materials stored between the starch granules and the latter when carbohydrate synthesis is interfered with and the percentage of crude protein progressively increases as the kernels become more shrunken.

Soil reaction also affects wheat strength through its effect upon the composition of the nutrient supply. In passing from an acid to an alkaline reaction the soil potash becomes less available whereas the supply of phosphates becomes more available.

The variety of wheat and yield per acre were included incidentally in the study, since they influence quality of crop as received by the mills. The quality, as well as quantity, of protein differs with variety. By taking advantage of

these characteristics, the strength of wheat in a given area may be altered through use of a suitable variety; thus, low-protein varieties should be grown in sections naturally tending to produce wheat too high in protein content.

[California weeds and their control] (*Calif. Dept. Agr. Bul., 25 (1936), No. 2, pp. 213–215, 273–275, 280–282, pl. 1, figs. 2*).—Descriptions and control measures for several weeds are given in articles entitled A Rare Case of Dodder (*Cuscuta indecora* Choisy) Attacking Olive in California, by G. L. Stout (pp. 213–215); "Kelp" or Swamp Knotweed (*Polygonum coccineum* Muhl.), by W. S. Ball and M. K. Bellue (pp. 273–275); and Garden Rocket, *Eruca sativa* Mill., A "New" Flax Weed, by M. K. Bellue (pp. 280–282).

Thermal death point of certain weed seeds, C. Y. Hopkins (*Canad. Jour. Res., 14 (1936). No. 1, Sect. C. pp. 178–183, figs. 4*).—Lethal temperatures for 15 min. heating, as measured by subsequent germination tests, approximated for Indian mustard 100° C., wild oats 105, wild mustard 95, redroot pigweed 85, lambsquarters 95, stinkweed 85, milkweed 95, sunflower 100, parsley 90–95, hares-ear-mustard 80, ballmustard 85, and Russian-pigweed 80°. The results indicated that there is a critical temperature below which moderate periods of heating have little effect on viability; at higher temperatures the germinating power falls off rapidly.

Physiological problems connected with the use of sodium chlorate in weed control, A. S. Crafts (*Plant Physiol., 10 (1935), No. 4, pp. 699–711*).—Effects which chlorates may have on plants and their relations with weed control practices, discussed in the light of present knowledge, include physiological action, killing of plant tissue, physiological responses of plant cells, killing following leaf absorption and transport to the roots through the xylem, and killing plants with chlorates by absorption from the soil. See also other contributions from the California Experiment Station (E. S. R., 71, p. 41; 74, p. 336).

HORTICULTURE

Four seasons in your garden, J. C. Wister (*Philadelphia and London: J. B. Lippincott Co., 1936, pp. 306, pls. 65, figs. 61*).—A presentation of general information, with particular reference to plant materials.

Seedling growth in partially sterilised soil, W. J. C. Lawrence and J. Newell (*Sci. Hort. [Wye, Kent, Eng.], 4 (1936), pp. 165–177, figs. 7*).—At the John Innes Horticultural Institution it was found that calcium materials should not be added to the soil compost before sterilizing. The addition of superphosphate after sterilizing gave highly beneficial results, probably by correcting the existing deficiency of phosphorus in the compost and also by offsetting the check to growth commonly following sterilization. When the ingredients, loam, peat moss, and sand, were sterilized separately there was considerably less check to growth than where mixing was done before sterilizing. The addition of peat moss to a compost before sterilizing was particularly harmful. It was evident that all fertilizers should be added to the soil compost after the sterilizing process.

Some physiological studies with calcium cyanamide and certain of its decomposition products, R. M. Smock (*Ohio Sta. Bul. 555 (1935), pp. 46, figs. 14*).—The statement in the original abstract (E. S. R., 74, p. 641), namely, "Hydrogen cyanamide is said to be a potential source of injury when the cyanamide applications are too large or improperly made or applied to highly alkaline soils," should read "Hydrogen cyanamide is a potential source of injury to the peach, apple, and tomato with cyanamide applications on soils devoid of colloidal or organic matter. Dicyandiamide is a potential source of injury

with cyanamide applications when extremely large and improperly made treatments are made or on highly alkaline soils."

A study of definitions of cull fruit and vegetable products from the standpoints of physiological, phytopathological, and phytocommercial criteria [trans. title], L. PASINETTI and E. AGOSTONI (*Nuovi Ann. Agr. [Italy], 15 (1935), No. 4, pp. 561–684, figs. 34*).—This is an extensive study.

[Horticultural studies by the North Louisiana Substation], S. STEWART (*Louisiana Sta., North Louisiana Sta. Rpt. 1935, pp. 19, 20*).—Brief notes are presented on the results of varietal and cultural trials with pecans and of varietal studies with apples, peaches, and grapes.

[Horticultural studies by the Massachusetts Station] (*Massachusetts Sta. Bul. 327 (1936), pp. 11, 27, 28, 57–59, 64–73*).—Brief reports are given on the progress of the following experiments: Onion set production, and onion breeding, both by M. E. Snell; response of the gardenia to certain stimuli, and plant containers, both by L. H. Jones; breeding snapdragons for varietal improvement and disease resistance, propagation studies on geraniums, the effect of plant nutrients, soil reaction, and light on gardenias, and propagation of gardenias, all by H. E. White; packet-seed studies, and comparisons of old and new varieties of vegetables, both by G. B. Snyder and A. P. Tuttle; seed treatment of lima beans, by Tuttle; fertilizer and cultural studies with asparagus, the improvement of various vegetables by seed selection, and storage of celery, all by R. E. Young; the interrelation of stock and scion in apples, comparison of cultivation and sod in bearing apple orchards, nitrate of soda for apples, comparison of cultivation and heavy mulching for apples, the effects of fertilizer limitation on fruit plants, and effect of potash and lime on apple trees, all by J. K. Shaw; tree characters of fruits, by Shaw and A. P. French; study of fruit varieties, and removal of toxic residues from apples, both by Shaw and O. C. Roberts; storage of apples, by Roberts; and blueberry culture, by J. S. Bailey.

[Horticultural studies by the New Hampshire Station] (*New Hampshire Sta. Bul. 289 (1936), pp. 7, 16–18*).—In this general progress report there are presented the results of spray management studies, by H. C. Woodworth, G. F. Potter, and E. J. Rasmussen; fruit bud formation, by Potter; apple pollination, and varieties of apples, both by Potter and L. P. Latimer; fertilizers for strawberries, and varieties of strawberries, both by Latimer; and varieties of tomatoes, by J. R. Hepler.

[Horticultural studies by the North Dakota Station], A. F. YEAGER (*North Dakota Sta. Bul. 286 (1935), pp. 73, 74, 75, 76, fig. 1*).—Brief mention is made of progress of work in the breeding of various fruits and vegetables.

[Horticultural studies by the Wisconsin Station] (*Wisconsin Sta. Bul. 435 (1936), pp. 1, 2, 92, 93, 128–131, fig. 1*).—The following studies are discussed: The results of pea-breeding work at the Ashland and Peninsular Substations, by E. J. Delwiche; the use of evergreens for the development of permanent snow barriers at the Hancock Substation, by A. R. Albert; trials of varieties of vegetables, by O. B. Combs, and of red raspberries, by J. G. Moore; value of mulches in preventing root injury to strawberries, by R. H. Roberts; testing of new apples, by Moore; factors affecting the set of cherries in the Sturgeon Bay district, by L. Langord and Roberts; and comparisons of various soil materials for propagating shrubs, by G. W. Longenecker.

Precooling and shipping California asparagus, W. T. PENTZER, R. L. PERRY, G. C. HANNA, J. S. WIANT, and C. E. ASBURY (*California Sta. Bul. 600 (1936), pp. 45, figs. 11*).—Presenting the results of a cooperative study conducted by the U. S. D. A. Bureau of Plant Industry and the station, the authors point out

that precooling of California asparagus designed for eastern markets has become a commercial practice because of the reduced refrigeration costs in transit and a better marketable product. The transit temperature of a precooled car averaged 45° F. the first day and 47° for the first 4 days as compared with 61° and 56°, respectively, for a nonprecooled car. Refrigeration methods in which the ice bunkers were not refilled in transit or were refilled only once were possible in the case of precooling. Data are presented on the amount of ice required to cool a carload of asparagus from 70° down to 40° in 12 hr. and also on the value of forced circulation of the air for hastening cooling. Air was distributed through the load more effectively with portable fans placed at the top bunker ducts and directed downward toward the top center of the load than with fans placed above the brace at the doorway and directed toward the ceiling. Air temperatures lower than 30° were hazardous if directed on the asparagus for any length of time.

Asparagus cooled by immersing two-thirds of the length of the spears in ice water for from 10 to 12 min. carried as well as asparagus precooled by fans, and, since the water-cooled asparagus reached the market in good condition, the belief that wetting is harmful is considered erroneous. Cellophane wraps or caps were of no advantage, and in fact when asparagus was completely enclosed in moisture-proof cellophane mold development was increased. No significant difference was evident in the precooling rate, transit temperatures, or shipping quality of asparagus grown on peat or on sediment soil, or between varieties. Asparagus allowed to develop until the cut portion was all green showed a higher respiration rate than that cut when one-third of the lower end was still white. Green asparagus cooled at a lower rate, was warmer in transit, and showed slightly more wilting, mold, and slime infection. The initial temperatures, cooling rates, transit temperatures, and arrival conditions of asparagus cut early but not picked up until afternoon were similar to those of asparagus not cut until just before picking up in the afternoon. Quality was lost, however, by any delay in getting the product under refrigeration. The respiration rate of asparagus, even at low temperatures, was found very high. At 70° respiration declined rapidly after cutting, but at low temperatures declined only slightly at first and then was maintained at a fairly constant point.

Factors affecting the yield of kraut cabbage in Ohio as determined by a survey and cooperative field tests, C. WADLEIGH, H. D. BROWN, and R. YOUNG (*Ohio Sta. Bul. 566 (1936), pp. 29, figs. 7*).—Observations in 1931 on approximately 350 cabbage fields in northern Ohio indicated the importance of proper soil management as compared with fertilizer applications. Next to the percentage of stand, freedom from weeds was the most important factor. Sandy soils were found superior to heavy loams, and the darker colored soils were more productive than the light colored. Within the limits observed yield differences could not be associated significantly with soil pH. Nitrates, as determined by the diphenylamine test, were a factor in yield, but available phosphorus, as indicated by the Bray test, could not be associated with yield. The condition of the soil at transplanting time had a marked effect on yield. Other cultural factors concerned with yield were time of transplanting, planting distance, and depth and number of cultivations. Variety was an important factor, particularly as related to the use of yellows-resistant kinds.

Under the prevailing conditions cabbage failed to respond to applications of manure and, although yields tended to increase with increasing amounts of commercial fertilizer, the increments were not significant. The method of applying fertilizer was not a material factor. However, in a series of fertilizer plats established in seven different locations cabbage was found most respon-

sive to phosphorus and least to potassium. These plats also suggested that under alkaline conditions cabbage utilizes ammonia nitrogen more freely than nitrate nitrogen, with opposite results under acid conditions.

Apparently environmental conditions which hindered the accumulation of sugars in the cabbage also impaired keeping quality. Cabbage with a low sugar content or which was grown in a seriously unbalanced nutritional environment made an inferior sauerkraut. A deficiency of potassium in the presence of adequate nitrogen appeared to be detrimental to the quality of kraut cabbage.

Effects of some environmental factors on growth and color of carrots, W. C. BARNES ([*New York*] *Cornell Sta. Mem. 186 (1936). pp. 36, figs. 14*).—Stating that carrots fail frequently to develop a deep orange color in all parts of the root, the author presents the results of studies with the Chantenay carrot grown under controlled environments in the greenhouse.

Air temperatures were found to exert a profound influence on both color and growth. Total growth was greater, the type of growth more nearly normal, and the color best between 60° and 70° F. than at temperatures above or below. Above 60° to 70° the roots became shorter and below 60° longer and more tapered. Between 40° and 50° the roots were enlarged only at the top. Comparisons between fluctuating and constant temperature indicated that root shape is governed largely by average temperature rather than range. Soil moisture had some influence on the shape of roots, those with a low supply being more tapered at the lower extremity.

The photoperiod had no effect on the shape of root, and when soil moisture and temperature were favorable day lengths as short as 9 hr. were not limiting. Above or below the temperature range of 60° to 70° the color of roots was decreased, and at 40° to 50° the external color was of a bleached character. An examination showed a lack of pigment in the cells. No change in color was secured by altering the photoperiod, and only in the case of actual deficiency did any of the usual fertilizer elements affect coloration. Carotene increased markedly for about 100 days from planting and was higher in large than small carrots of the same age. Assay tests in the laboratory of animal nutrition showed higher vitamin A values than were indicated by carotene, but the ratios between young and old roots followed the same general order. There was no important change in total sugars throughout the season, but there was an increase in sucrose and a decline in glucose as the season advanced. Old carrots lost less weight in storage than did young carrots, and in both groups the losses in weight, sucrose, and carotene were minimized at 32°.

Extending the use of melons by frozen storage, R. B. HARVEY, W. B. COMBS, R. H. LANDON, and A. M. CHILD (*Fruit Prod. Jour. and Amer. Vinegar Indus., 15 (1936), No. 5, pp. 146–148*).—At the Minnesota Experiment Station it was found possible to store ripe muskmelons considerable periods at or near 0° F. Varieties with full aroma and flavor yielded a satisfactory product after 8 mo. of freezing storage. In the case of watermelons it was found impractical to store whole fruits because of the difficulty in separating the seeds from the frozen flesh. Information is also presented on the use of the stored products.

Tomatoes as a fall crop in the greenhouse, I. C. HOFFMAN (*Ohio Sta. Bimo. Bul. 180 (1936), pp. 70–78, figs. 2*).—Based on experiments extended over a period of years, there are presented suggestions as to varieties, time of sowing seed, growing of plants, handling of the soil, fertilizers and manures, transplanting, pruning and training, mulching, watering, heat requirements, pollination, and harvesting.

Absorption of water by the foliage of some common fruit species, W. G. BRIERLEY (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 277–283*).—In studies at the Minnesota Experiment Station detached wilted leaves of various species of horticultural plants were, after sealing the cut end of the petiole with paraffin, immersed for 2 hr. in water at room temperature. All of the different leaves were able to regain some or all of their weight lost during wilting. Plants of the genus *Rubus* as a whole were able to regain rapidly their turgidity, and in fact some attained greater weight than before dry. The Concord grape, the Bosc pear, and the Bing cherry were among species of notable slowness in absorbing water. Latham raspberry leaves endured successfully four repetitions of drying and wetting. Latham leaves in a saturated atmosphere for 144 hr. failed to regain weight but when immersed in water recovered much of their lost moisture. Provided, however, the wilted leaves were first dipped for a moment in water before placement in the saturated atmosphere there was a definite recovery of weight. Wilted Latham leaves placed up side down on water in a closed jar regained their water content slowly. Fruiting laterals of Latham when sprayed with water to simulate rain regained their fresh weight. The results suggest that leaves of many fruit plants are able to absorb rain water to some extent at least.

Fruit storage in caves [trans. title], M. STAEHELIN (*Landw. Jahrb. Schweiz, 50 (1936), No. 2, pp. 121–135, fig. 1; Ger. abs., pp. 134, 135*).—Stating that the keeping of apples depends primarily on the variety but also on the system of culture and spraying employed in the orchard, the author states that the temperature of caves should be held at a low point with a relative humidity between 83 and 88 percent. Since the air entering the cave through ventilators was dry, wetting of the floor was necessary. Rubbing the fruits lightly with wax and placing them in pulverized peat after first wrapping in paper were helpful practices in the case of varieties with a tendency to shrivel, such as Boskoop and Canada Reinette. Paraffin wraps gave no better results than the methods mentioned. Decay was not influenced by any of the methods but depended primarily upon the careful selection of fruit before storage. Rinsing the boxes and crates in a hot bath of 4 percent soda prior to storage is recommended.

The gas-storage of fruit: A warning note, F. KIDD and C. WEST (*Sci. Hort. [Wye, Kent, Eng.], 4 (1936), pp. 75–78*).—The authors point out that present knowledge of the use of carbon dioxide in fruit storage is inadequate as a basis for positive recommendations as to the correct conditions regarding temperature and concentration of carbon dioxide and of oxygen, and they suggest the need of fundamental research on physiological aspects.

Stocks for deciduous fruits under study at experiment stations, compiled by G. E. YLEKES (*U. S. Dept. Agr., Bur. Plant Indus., 1936, pp. 20*).—This is a compilation of experimental work with stocks for deciduous fruits and related propagation studies in progress at the various State experiment stations and the U. S. Department of Agriculture.

Selection of orchard sites in southern Michigan, N. L. PARTRIDGE and J. O. VEATCH (*Michigan Sta. Circ. 155 (1936), pp. 27, figs. 19*).—Pointing out that there are thousands of acres of Michigan orchards located on soils never adapted to or no longer of value for orcharding, the authors discuss various factors that should be considered in selecting orchard sites.

Certain structural conditions of the soil, such as the presence of underlying hardpans and a tendency to waterlog, are undesirable. The most favorable soils are said to be intermediate in texture, with sufficient sand and gravel in the subsoil to permit root penetration but at the same time containing

sufficient silt and clay to retain moisture during droughty periods. The amount of water in the soil and its availability during the growing season is of greater importance than any other single factor. Various types of soil are discussed in detail.

Pears are similar to apples in water requirements, whereas peaches and cherries do not require as much moisture and may be profitably grown on soils too dry for apples. Grapes, capable of existing on nearly all except very imperfectly drained soils, thrived better on soils of moderate moisture capacity. Raspberries and strawberries require moist surface soil.

With respect to fertility, fruits thrived best on soils of moderate strength, and in the case of upland soils there are few instances of excessive fertility. Erosion is probably responsible for larger losses of soil fertility than any other factor, and in this connection erosion is directly correlated with the degree of slope. Loss of fertility due to erosion of the fertile surface layers is not easily corrected by the addition of fertilizers. The large lakes, such as Michigan, Huron, and Erie, exert a favorable influence on the climate of adjacent areas. Minimum winter temperatures are important, especially in the case of the peach. Generally speaking, the best orchard sites are located on broad ridges or upland plains bordering depressions or on loamy soils underlaid by gritty clay of relatively open structure.

Apple breeding: Inheritance of tree shape in apple progenies, H. L. LANTZ and S. J. BOLE (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 256–260*).—Measurements taken in 1929 by the Iowa Experiment Station on some five thousand apple seedlings derived from 55 different crosses and set in the orchard in 1924 indicated that round shape of the tree top is partly dominant over upright, upright spreading, and spreading types of growth. Apparently the inheritance of tree shape depends on a number of genes, which upon recombination produce shapes ranging from spreading to upright. Partial dominance was shown by the fact that slightly over half of 1,511 trees with Delicious as mother parent fell within the round-headed class. When both parents were of the spreading type there was noted a constant tendency for the mean of the progeny to be above the mean of both parents, and to fall between the parents when one was spreading and one upright spreading.

Heavy mulching in bearing apple orchards, J. K. SHAW and L. SOUTHWICK (*Massachusetts Sta. Bul. 328 (1936), pp. 15, figs. 2*).—Halves of each of two blocks, one of McIntosh and the other Wealthy, were mulched heavily with low-grade hay for comparison with cultivation plus cover crops. No fertilizer was applied to the mulched areas and none to the tilled areas until 1931, when the trees were obviously losing vigor. The treatments were begun in 1921 when the trees were about 10 yr. old.

After the first 3 yr. soil nitrates were much higher under the mulch, rising to a maximum of 400 p. p. m., but this excess did not produce too much growth. Growth and yield were greater on the mulched than on the tilled areas, and the fruit matured a little later on the mulched trees, with no marked difference in color or quality. Premature dropping was greater on the mulched trees, but the percentage varied from year to year. Wealthy trees on Doucin roots dropped less fruit than Wealthys on standard stocks.

Soil temperature during the growing season differed little between treatments except during hot weather, when it was somewhat lower under mulch. Moisture in the surface layer was higher under the mulch during dry periods. In conclusion the authors suggest that heavy mulching is a satisfactory system of orchard management except for cost and possible injuries from fire and mice. Under certain conditions, such as comparatively steep slopes, stony land, and loose gravelly soils, mulching is particularly useful.

Fruit thinning and biennial bearing on individual main leaders of Yellow Newtown apples, C. P. HARLEY, M. P. MASURE, and J. R. MAGNESS (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 43–46*).—Employing essentially the same technic as in the earlier study (E. S. R., 72, p. 619), it was again noted that heavy fruit thinning performed within 40 days after full bloom induced a high percentage of blossoms and fruit on the main leaders in the off year. A total of 70 leaves (1,900 to 2,000 cm²) produced nearly twice as many blossom buds as did 50 leaves. Time was a very important consideration, since 73 days after full blooom thinning to 70 leaves failed to induce more than 5 percent of the spurs to form blossom buds. Once the biennial habit was broken, the annual habit was maintained with careful attention to thinning. It was noted that the individual main leaders may function independently from the remaining portions of the tree in so far as the transport of elaborated materials was concerned. It is concluded that fruit bud formation is wholly dependent upon the leaf activity of the main leaders on which the buds occur, and that the factors which determine fruit bud initiation are produced in the same season that differentiation takes place rather than from reserve materials in the tree.

Spray residues and their removal from apples, W. S. HOUGH (*Virginia Sta. Bul. 302 (1936), pp. 20, figs. 6*).—Records taken on the fruit harvested from a number of well sprayed orchards indicated that June 12 is about the latest date that lead arsenate may be used on fall or winter apples without necessitating washing, and even then if oil is used with the lead arsenate washing may be necessary. Time rather than number of cover sprays appeared to be the critical factor. With summer varieties washing may be necessary even if no sprays are applied after June 12. Where sodium fluoaluminate was used in late June as a substitute for lead arsenate, it was evident that fluorine residues might become a problem.

For most residues occurring on Virginia apples from 2 to 3 gal. of hydrochloric acid in 100 gal. of water was sufficient. The need of renewing the hydrochloric acid solution each day if a thousand or more bushels are washed daily is stressed. Methods of determining the percentage of acid in the wash are discussed. It was found that the volume of fresh rinse water must be varied with the concentration of the acid solution and with the type of washer. Where insufficient water is available for adequate rinsing the addition of lime to the rinse water to neutralize the acid is advised. Methods of heating the washing solution are discussed.

Concerning types of washers, brush washers were more effective for fruits carrying residues difficult to remove. Other fruit was washed satisfactorily in any of the types of machines under trial. Wetting agents were of little value in increasing the efficiency of residue removal by unheated acid solutions when the fruit remained in the bath only from 45 to 60 sec. On the other hand, in heated solutions wetting agents increased efficiency. The use of bordeaux mixture in the cover spray made the removal of lead arsenate less difficult, whereas oil made removal more difficult. Hydrochloric acid was more efficient than sodium silicate in removing residues of lead, arsenic, and fluorine.

Pollination experiments with pears [trans. title], E. JOHANSSON (*Sveriges Pomol. För. Årsskr., 37 (1936), No. 1, pp. 53–74, figs. 5*).—Information is presented on pollen germination in sugar solutions, on suitable pollinizers for different varieties, and on intersterility relationships. The following combinations showed evidence of intersterility, Louise Bonne × Seckel, Esperens Herrepäron (Lucrative) × Seckel, and Esperens Herrepäron × Louise Bonne. Parthenocarpy was observed in Alexander Lucas, Louise Bonne, Brandywine, Esperens Herrepäron, Trevoux, Seckel, and Wilder.

Pollination experiments with pears near Stockholm [trans. title], G. CALLMAR (*Sveriges Pomol. För. Årsskr., 37 (1936), No. 1, pp. 74–77*).—Complete unfruitfulness was observed in self-pollinations of the varieties Buerre Diel, Marguerite Marillat, Herzogin Elsa (Elsa), Moltke, and Rörstrand. Suitable pollinizers are indicated for these and other varieties.

The effect of adverse climate on the sizing of cherry fruits, R. L. MCMUNN (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 303–307, fig. 1*).—Observations by the Illinois Experiment Station in 1933 on samples on cherries taken from 12 varieties at 2- to 7-day intervals from the time of shuck shedding to full maturity showed a decrease in volume and shriveling in six varieties, Early Richmond, Napoleon, Rockport, Paul, Gold, and Black Republican, as maturity was approached. Gold was not harvested because of extreme shriveling. None of the other six varieties, May Duke, Ostheim, Windsor, Montmorency, Dyehouse, and Wragg, decreased in volume, although they did not attain their usual size.

June was characterized by clear, hot days and almost no precipitation until after the twenty-fifth day. That soil moisture deficit was not the cause of the shriveling was indicated by moist soil at a 3-in. level on June 22. Apparently the high transpiration rates in June and the extensive leaf area resulted in drawing water from the fruits during the day, and six of the varieties were unable to recover during the night. The light crop with less fruits from which the leaves could draw water is also a factor. However, Early Richmond, the only variety with a good crop, was among the six varieties to show decreased volume. Presumably low humidity was the most important factor in the decreased size.

Notes on sweet cherry doubling, L. R. TUCKER (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 300–302*).—Observations by the Idaho Experiment Station on the percentage of double pistils in a commercial orchard of Bing, Lambert, and Napoleon cherries in 1932, a year of unprecedented doubling, showed 46, 43, and 28 percent, respectively. The percentages of cull fruits in the three varieties were, respectively, 44, 13, and 26 percent. The Lambert variety showed an unusual capacity for sloughing off the unfertilized ovary. The percentages of doubling were slightly lower on spurs than on 1-yr. shoots. The dual ovaries were more nearly separate in Lambert than in the other two varieties.

Growing trees from "non-viable" peach seeds, O. W. DAVIDSON (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 308–312, figs. 3*).—Continuing investigations (E. S. R., 72, p. 339), seed of Golden Jubilee, Cumberland, and New Jersey No. 71 peaches were grown in sterile cultures in large glass jars. Golden Jubilee produced less than 50 percent viable seeds and Cumberland none except under artificial culture. Natural viability was observed to vary in varieties from year to year. All the cultured plants ceased growth when only 2 to 3 in. tall, but when subjected thereafter to temperatures below 45° F. for 5 weeks they resumed vigorous development when again returned to a favorable temperature. Before afterripening the epicotyl developed before or at the same time as the hypocotyl. Following afterripening the hypocotyl developed first. Root growth did not appear to be greatly influenced by the lack of afterripening. Of several methods of handling young seedlings after germination in artificial culture, that in which the embryo in sterile culture was held at room temperature for 10 days and then placed in cold storage for 6 weeks at 3° to 7° C. (37.4° to 44.6° F.) was most successful. It was evident, however, that 8 or 9 weeks at the low temperature would have been better.

Studies on the resistance of peach buds to injury at low temperatures, F. P. CULLINAN and J. H. WEINBERGER (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 244–251, figs. 2*).—Utilizing controlled freezing chambers and twigs taken from the orchard throughout the leafless period, it was found in these studies by the U. S. Department of Agriculture at Beltsville, Md., that the amount of injury from cold varies with seasonal conditions, stage of development of the bud, and qualitative and perhaps quantitative conditions within the bud. It was evident that seasonal growing conditions and the size of the crop may influence the hardiness of the buds. Following a season in which blossom buds attained complete development early in September, the rest period in certain varieties was completed in early November. In most varieties in any season the natural rest period ended in January, after which continued dormancy was dependent on temperature. Marked differences were observed in the hardiness of buds on a single tree. In late winter following severe cold it was frequently observed that the only surviving buds were on the basal portion of moderately vigorous shoots or shoot spurs. Variation in cold resistance was found to be related partly to the location and condition of the orchard. For example, a small percentage of Elberta buds at Beltsville survived at —10° F., while 15 miles southward at Arlington Experiment Farm, Va., all Elberta buds were killed at —7°.

Flower characters for classification of plum varieties [trans. title], C. G. DAHL (*Sveriges Pomol. För. Årsskr., 37 (1936), No. 1, pp. 1–52, figs. 47*).—Based on measurements of the flower parts and detailed descriptions, a classification is proposed for plums.

Plums in Missouri, P. H. SHEPARD (*Missouri Fruit Sta. Bul. 29 (1936), pp. 30, figs. 16*).—Practical information is presented upon varieties, cultural requirements, spraying, pruning, etc.

Pollination of the highbush blueberry, T. A. MERRILL (*Michigan Sta. Tech. Bul. 151 (1936), pp. 34, figs. 19*).—Using plants growing at the South Haven Substation and employing essentially the methods of technic and pollination ordinarily used in fruit studies, the author found, somewhat contrary to the literature, that self-pollination gives satisfactory commercial sets of fruit in all the varieties of highbush blueberries under observation. Histological examinations of blooms indicated that self-pollination is a perfectly normal process. Apparently pollination is not the problem with the blueberry that it is with many other fruits and, practically speaking, involves more the question of providing insects to perform the pollination. Honeybees were found incapable of pollinating effectively certain varieties, such as Pioneer and Cabot, because of the depth and narrowness of the blossoms. Bumblebees were found more effective because of their longer tongues.

Blueberry pistils were found to remain receptive for relatively long periods. Emasculated Rubel flowers in 1933 set 63.4 percent when the pollen was applied 120 hr. after emasculation. In fact higher sets were often secured when pollination was deferred several hours than when done immediately after emasculation. Varieties differed somewhat in their capacity to set fruit, Cabot having a consistently poor record when selfed, crossed, or open-pollinated. Cabot pollen, on the other hand, was satisfactory in controlled crosses or when tested for germinability in cane sugar solutions. In most cases varieties of pollen showed consistently higher germination as the sugar concentration was increased up to 12 percent, the maximum employed in the study.

Pruning and training American and hybrid grapes in Idaho, L. R. TUCKER (*Idaho Sta. Circ. 76 (1936), pp. 7, figs. 5*).—For the most part this paper com-

prises general information on methods and practices in pruning and training. In a comparison between spur and cane pruning of American-type grapes, the 10 spur-pruned vines yielded 188 lb. of fruit averaging 2.67 oz. per cluster as compared with 300 lb. of fruit averaging 3.15 oz. per cluster for the 10 cane-pruned vines.

Trunk growth and the water relation in leaves of citrus, F. F. HALMA (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 273–276, figs. 2*).—Using as a measure of the water requirements the relative saturation deficit of leaves, the author discusses the results of observations in plats of the Washington Navel orange at the California Citrus Experiment Station. The plats were supplied with different amounts of water, all within the range of commercial practice in southern California. On the drier plat the relative saturation deficit readings showed three distinct peaks, with the leaves smaller at maturity than on the better-watered plats. The rates of trunk growth were similar until July, with increasing divergence from thereon. On a day when the temperature rose to 117° F. accompanied by puffs of hot wind and a relative humidity of only 14 percent, relative saturation deficits averaged 4.84 and 4.67 percent on the two differential plats, the effects on the water balance in the leaves being insignificant in comparison with those produced by a lack of available water from the soil. The results are said to indicate the importance of maintaining a relatively favorable water balance in the leaves. Fruit growth studies, although showing a temporary lag in fruit increment when the relative saturation deficit was high, failed to show any material difference in the final size of fruit on different plats.

The pineapple, M. O. JOHNSON (*Honolulu: Paradise Pac. Press, 1935, pp. XII+306, pls. 2, figs. 95*).—This is a general discussion of the botany, varieties, selection of soils, culture, propagation, control of insects, diseases, and other pests, marketing, canning, etc.

Growth and yield of pecan trees as affected by thinning the stand of trees and other orchard practices, H. L. CRANE, M. B. HARDY, N. H. LOOMIS, and F. N. DODGE (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 33–37*).—Of three treatments employed in a 24-year-old Stuart orchard near DeWitt, Ga., namely, heavy application of sulfate of ammonia, severe pruning, and the reduction of the number of trees per acre, the last was the most effective as measured in circumference gain the next 2 yr. Heavy pruning actually depressed growth below the controls. Tree reduction resulted in the spreading of the tree tops and the development of new wood in the interior. In production the sulfate of ammonia gave the largest yields per tree in the 2 yr., closely followed by the tree-reduction plat. Heavy pruning practically reduced production to zero. The best filled nuts were produced on the tree-reduction plat, but severe drought prevented reliable readings on nut size. The authors conclude that removing fully half the trees in crowded pecan orchards, supplemented with good culture, is the logical way of restoring productivity.

Further notes on pecan filling and maturity, A. H. FINCH (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 24–28, fig. 1*).—In continuing observations (E. S. R., 72, p. 486), counts were made in 1934 of shoots bearing pistillate flowers and of fruit set on Burkett trees which showed wide differences in vegetativeness and nut filling in 1933. There was a much higher percentage of blossoming and setting in 1934 on the highly vegetative trees. Observations during the maturation period on the percentage of moisture, N, and P in the leaves, shucks, and nuts, and on the specific gravity of nuts indicated an inverse relation between N and moisture in the plant tissue and the filling of the nuts. Preharvest germination on the poorly and highly vegetative trees was 10 and 58

percent, respectively. Attempts to control vegetativeness in 8-year-old Burkett trees by varying the water supply, the N supply, and applying cerclose to depress nitrates were not wholly effective, but nuts on plants where moisture and nitrates were maintained at a high level in late summer had considerably more preharvest germination. Filling was not greatly different on any of the plats. Whereas blossoming seems to be associated with a relatively high degree of vegetativeness, the filling of nuts seemed to require the opposite conditions during the summer months.

Effect of bagging on the drop of pecan clusters, H. L. CRANE, M. B. HARDY, F. N. DODGE, and N. H. LOOMIS (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 38–42, figs. 2*).—Deploring the heavy dropping of pecan nuts between bloom and harvest, the authors discuss the results of experiments in five Schley orchards near Albany, Ga., in which an attempt was made to eliminate injury to the nuts from insects and diseases by covering the clusters with cellophane. The clusters were bagged about 4 weeks after the appearance of the pistillate flowers so as to permit pollination and allow for blossom drop.

A very heavy drop occurred about 4 weeks after bagging without a parallel drop in the open. Accumulation of moisture in the cellophane bags was believed to be the causal factor, the bag apparently reducing transpiration and increasing the internal pressure to a point of rupturing certain tissues and causing abscission. When manila bags were used the percentage of dropping was much smaller than in cellophane, and the nuts were somewhat larger and heavier than the controls. The beneficial effect of manila sacks is believed due to the protection of the nuts from the shuckworm. The drop from control clusters was fairly large and uniform throughout the season, whereas that of bagged clusters occurred early and almost ceased after August 1.

Effect of nut thinning on size, degree of filling, and annual yields of pecans, H. L. CRANE, M. B. HARDY, N. H. LOOMIS, and F. N. DODGE (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 29–32*).—Pointing out the tendency for pecans to bear more or less irregularly and suggesting that nutritional conditions in the tree may be the controlling factor, the authors report that thinning the nuts on Moore trees in August of their bearing year, just about the time the hardening of the shells begins, definitely reduced the tendency to biennial production; in fact four of the thinned trees produced more nuts in the next year than in the on year. Observations on leaf area indicated that the optimum leaf area assuring the accumulation of adequate reserves to provide sufficient bloom the following year is 8 to 10 leaves per nut. The degree of filling of nuts was found dependent to a large extent on the number of leaves. Drought may enter as a factor by causing defoliation and by decreasing the size of nuts.

In conclusion the authors emphasize the fact that nut thinning cannot yet be recommended as a commercial practice, although the limited data indicate that thinning may be expected to increase not only the size and degree of filling of the nuts of any one crop and the bloom the next year but may over a period of years increase the annual yields per tree by maintaining nutritional conditions within the tree.

The tung-oil tree in Georgia, H. L. COCHRAN (*Georgia Sta. Circ., 108 (1936), pp. 8, figs. 3*).—General information is presented on climatic and soil requirements, varieties, propagation, planting, culture, pruning, control of pests, yields, etc.

Hardy chrysanthemums, A. LAURIE (*Ohio Sta. Bimo. Bul. 180 (1936), pp. 78, 79, fig. 1*).—Among the better Korean hybrids are listed Apollo, Ceres,

Daphne, Diana, Mars, and Mercury. Suggestions are included relative to propagation and the handling of young plants.

The bulbous iris and its outdoor culture in Massachusetts, F. A. WAUGH (*Massachusetts Sta. Bul. 330 (1936), pp. 15, figs. 5*).—In connection with a general account of the botany and culture, there are presented descriptive notes on a large number of varieties.

100 per cent thornless roses, N. E HANSEN (*Amer. Rose Ann., 1936, pp. 43, 44*).—By rigorous selection in large seedling plantations the South Dakota Experiment Station succeeded in isolating roses that were completely thornless.

Tulips, D. GRIFFITHS (*U. S Dept. Agr. Circ. 372 (1936), pp. 64, pls. 12, figs. 6*).—This circular, superseding Department Bulletin 1082 (E. S. R., 48, p. 238), presents general information on the botanical characteristics, propagation, soils, and fertilizers, care of the growing plants, handling and curing of the bulbs, use of tulips for outdoor planting and forcing, control of various pests, etc.

FORESTRY

Growth and survival of deciduous trees in shelter-belt experiments at Mandan, N. Dak., 1915–34, E. J. GEORGE (*U. S. Dept. Agr., Tech. Bul. 496 (1936), pp. 48, figs. 9*).—Observations on a series of 22 shelterbelt plantings embracing 18 different tree species established at the Northern Great Plains Field Station during the years 1915–17 showed only 7 species, namely, Chinese elm, green ash, boxelder, chokecherry, Siberian pea-tree, buffaloberry, and American plum, to have maintained satisfactory growth and survival. All poplar, willow, and birch species showed heavy killing back and severe mortality throughout the period. Evidence was accumulated to suggest that a minimum of 11 rows of trees is needed on very exposed sites if the buildings and yards are to be kept free of drifting snow. For less exposed sites from 6 to 8 rows may be sufficient. For orchard and garden protection where drifting snow may be desirable for covering the plants and accumulating moisture a maximum of 4 rows is believed adequate.

The growth habit of the species in the adjacent row was found to govern to a large extent the distance that is to be employed between rows. Siberian pea-tree and buffaloberry maintained a satisfactory growth when spaced 2 by 8 or 4 by 8 ft. American plum, chokecherry, and green ash grew satisfactorily spaced 4 by 4 ft., except when crowded by more rapid developing species. Boxelder and Chinese elm showed preferences for 4 by 8 and 6 by 12 ft. spacing, respectively. If the shelterbelt is to give maximum protection, low-growing, bushy types should be planted on the outside with the taller species in the center. The development of conditions within the shelterbelt approximating a natural forest appeared to be highly desirable.

[Studies with white pine reproduction by the New Hampshire Station], K. W. WOODWARD (*New Hampshire Sta. Bul. 289 (1936), p. 24*).—Brief notes are given as to the reproduction on cut-over areas handled in different manners at the time of lumbering.

DISEASES OF PLANTS

Abstracts of papers presented at the twenty-seventh annual meeting of the American Phytopathological Society, St. Louis, Missouri, December 31, 1935, to January 3, 1936, inclusive (*Phytopathology, 26 (1936), No. 2, pp. 83–114*).—Abstracts of the following papers are included: Progress in the Development of a New Tomato Variety Resistant to Leaf

Mold, by L. J. Alexander (p. 86); Growth and Distribution of *Ceratostomella ulmi* in Tissues of Elm, by W. M. Banfield and A. L. Smith (p. 86); Correlation of Pathogenicity and "Viscosity" in Cultures of *Phytomonas tumefaciens*, by T. O. Berge, A. J. Riker, and I. L. Baldwin (p. 86); Some Insect and Host Relationships of the Potato Yellow Dwarf Virus (p. 87), and Two Types of Yellows Resistance in Wisconsin All Seasons Cabbage, both by L. M. Blank (p. 87); Field Control of Die Back and Black Spot (p. 87), and The Effect of Certain Chemicals on the Defoliation of Rose Plants (pp. 87, 88), both by G. T. Boyd and J. J. Taubenhaus; Inflorescence Blight of the Date Palm [*Fusarium moniliforme* and *F. lateritium fructigenum*], by J. G. Brown and K. D. Butler (p. 88); Seed Treatment as a Control for Damping Off of Alfalfa and Other Legumes, and The Occurrence of Pythiaceous Parasites at Different Soil Levels in Relation to Fallowing Practices, both by W. F. Buchholtz (p. 88); *Melanconium betulinum* on *Betula* in Illinois, by J. C. Carter (pp. 88, 89); Does Heterocaryosis Account for the Production of Variants in *Helminthosporium*? by J. J. Christensen and F. R. Davies (p. 89); Studies on Methods for the Measurement of Disease Resistance in *N[icotiana] tabacum*, by E. E. Clayton (p. 89); Cross Inoculation and Morphological Studies on the *Peronospora* Species Occurring on *Chenopodium album* and *Spinacia oleracea*, by H. T. Cook (pp. 89, 90); Comparison of the Effectiveness of Seed-Treatment Materials for the Prevention of Seed and Seedling Decays [of Tomatoes] in Eastern Virginia, by H. T. Cook and J. A. Callenbach (p. 90); A Mosaic Disease of *Tithonia rotundifolia*, and Phloem Necrosis in the Stripe Disease of Corn, both by M. T. Cook (p. 90): Some Principles Underlying the Fungicidal Action of Mercury in Soils, by R. H. Daines (p. 90); Corn Smut—Latent and Expressed, by G. N. Davis (p. 91); The Occurrence in the United States of Two Types of Teliospores of *Tranzschelia pruni-spinosae*, by J. C. Dunegan (p. 91); Bacterial Wilt [*Bacterium solanacearum*] of Potatoes, Tomatoes, and Eggplant Controlled With Sulfur and Limestone, by A. H. Eddins (p. 91); Pythium Root Rot of Milo, by C. Elliott, L. E. Melchers, C. L. Lefebvre, and F. A. Wagner (p. 92); The Fungi Causing Decay of Pears in Washington, by H. English and F. D. Heald (p. 92); Further Study on the Nature of Immunity of Monocotyledonous Plants to *Phymatotrichum* [*omnivorum*] Root Rot, by W. N. Ezekiel, J. J. Taubenhaus, and J. F. Fudge (pp. 92, 93); Verticillum, a Probable Cause of a Spinach Wilt in Western New York, by E. L. Felix (p. 93); Effect of Take-all [*Ophiobolus graminis*] Lesions on the Roots, Crowns, and Culms of Wheat Plants, and Nitrogen Metabolism of *Ophiobolus graminis*, both by H. Fellows (p. 93); Browning Disease [*Polyspora lini*] of Flax in the United States, by H. H. Flor (pp. 93, 94); Mosaic of Lima Beans, by L. L. Harter (p. 94); Effect of Nutrients on Susceptibility of Tobacco Plants to Downy Mildew, and Promising Fungicides for Tobacco Downy Mildew Control, both by R. G. Henderson (p. 94); The Colored Zones [Due to Various Polypores] Associated With Decay in Trees, by H. Hopp (p. 95); The Problem of Drilling Dusted Seed: Effect of Graphite, by J. G. Horsfall and E. L. Arnold (p. 95); Genetic Types of Resistance to Bacterial Wilt [*Phytomonas stewarti*] of Corn, by S. S. Ivanoff and A. J. Riker (pp. 95, 96); Are Tobacco Plants Affected With Mild Mosaic Susceptible to Other Strains of the Virus? by E. M. Johnson and W. D. Valleau (p. 96); Virus Diseases of Peas, by F. Johnson and L. K. Jones (p. 96); Relation of Leaf Rust (*Puccinia triticina*) Infection to the Rate of Transpiration in Two Varieties of Wheat, by C. O. Johnston and E. C. Miller (pp. 96, 97); The Relation of Zinc Sulphate to Injury From Peach and Apple Sprays in the 1935 Season, by K. J. Kadow and H. W. Anderson (p. 97); Progress of Studies of the

Epidemiology and Control of Cherry Leaf Spot, by G. W. Keitt, E. C. Blodgett, and R. O. Magie (p. 97); Cytological Studies of the Parasitism of Two Monoconidial Isolates of *Venturia inaequalis* on the Leaves of Susceptible and Resistant Apple Varieties, by G. W. Keitt and C. J. Nusbaum (pp. 97, 98); A Cowpea Resistant to Fusarium Wilt and Nematode Root Knot, by J. B. Kendrick (p. 98); A Vascular *Fusarium* Disease of Radish, by J. B. Kendrick and W. C. Snyder (p. 98); Entry of *Fusarium moniliforme* and *Cephalosporium acremonium* Into Growing Corn Ears, by B. Koehler (pp. 98, 99); Anthracnose [*Colletotrichum lagenarium*]-Resistant Watermelons, by D. V. Layton (p. 99); The Relation of Soil Temperature to the Development of *Fusarium* Wilt of Muskmelon and the Demonstration of Internal Seed Transmission, by J. G. Leach (p. 99); Microorganisms Antibiotic or Pathogenic to Cereal Rusts, by M. N. Levine, R. H. Bamberg, and R. E. Atkinson (pp. 99, 100); Gall Production [by *Phytomonas tumefaciens*] in High and Low Carbohydrate Tomato Plants, by G. K. K. Link and H. W. Wilcox (p. 100); Comparative Physiology of Pathogenic and Nonpathogenic Crown-Gall Bacteria [*Phytomonas tumefaciens*], by M. M. Lyneis, A. J. Riker, and S. B. Locke (p. 100); Relative Adherence of Cuprous Oxide and Other Copper Fungicides, by R. O. Magie and J. G. Horsfall (pp. 100, 101); Perennial Phlox Resistant to Powdery Mildew, by E. B. Mains (p. 101); Peach Yellows and Little Peach Studies [*Macropsis trimaculata* disseminating the viruses], by T. F. Manns (p. 101); The Action of Fungous Spores on Bordeaux Mixture, by S. E. A. McCallan and F. Wilcoxon (pp. 101, 102); Collecting Microorganisms From Winds Above the Caribbean Sea, by F. C. Meier (p. 102); Control of Brown Patch [*Rhizoctonia solani*] in Turf by Fanning, by J. Monteith, Jr., and M. E. Reid (p. 102); A Partial-Vacuum Method for the Inoculation of Wheat and Barley With Loose Smuts, and Pathogenicity of Different Collections of *Ustilago tritici* and *U. nuda*, both by M. B. Moore (p. 103); The Influence of *Cercospora*-Infested Soil in Relation to the Epidemiology of *Cercospora* [*beticola*] Leaf Spot on Sugar Beets, by C. M. Nagel (p. 103); Progress of Studies of Eradicant Fungicides in Relation to Apple Scab [*Venturia inaequalis*] Control, by D. H. Palmiter and G. W. Keitt (pp. 103, 104); Distribution and Prevalence of *Ozonium* [*omnivorum*] Root Rot in Shelter-Belt Zone of Texas, by G. L. Peltier (p. 104); Progress of Spraying Experiments for Control of Apple Fire Blight, by J. A. Pinckard, G. W. Keitt, and A. J. Riker (p. 104); [Freezing Injury and Fungi in Relation to] Crown Girdle of Pear Trees, by A. G. Plakidas (p. 105); Effects of Some Copper Compounds on the Control of *Bacterium pruni* and on the Peach Tree, by R. F. Poole (p. 105); A [Fungus] Tuber Rot of Southern Potatoes, by G. B. Ramsey (p. 105); Effects of Seed Treatment on Disease-Free and Diseased Seed Corn (pp. 105, 106) and Flax Seed Treatment (p. 106), both by C. S. Reddy; Electrical Potentials Found in Studies on *Phytomonas tumefaciens* and Related Organisms and on Crown Gall, by A. J. Riker, J. A. Pinckard, and I. L. Baldwin (p. 106); The Abscission of Pear and Apple Blossoms in Relation to Infection by *Erwinia amylovora* and *Phytomonas syringae*, by H. R. Rosen (pp. 106, 107); Acquired Resistance of Potato to Latent Mosaic, and Reaction of a Green Mountain Potato Seedling to Composite Infections of Mild and Crinkle Mosaic and Different Types of Latent Mosaic Virus, both by E. S. Schultz and W. P. Raleigh (p. 107); Infection Studies With *Sclerotinia fructicola*, by M. A. Smith (p. 107); Studies on the Life Cycle and Control of *Fabraea maculata* on Kieffer and Garber Pears, by M. A. Smith and M. C. Goldsworthy (p. 108); An Improved Method for the Preparation of Crystalline Tobacco-Mosaic Virus Protein, by W. M. Stanley (p. 108);

Viroses of the Garden Pea, *Pisum sativum*, by M. W. Stubbs (pp. 108, 109); Studies on the Winter Injury of Apple Trees, by R. F. Suit (p. 109); Further Studies on the Fungicidal Properties of Sulphur, by J. J. Taubenhaus and G. T. Boyd (p. 109); Growth of *Phymatotrichum omnivorum* on Normal Roots and on roots Decayed by Root Rot, by J. J. Taubenhaus, W. N. Ezekiel, and G. E. Altstatt (pp. 109, 110); [*Cephalosporium* in Relation to] the Dayton Elm Disease, by L. R. Tehon and H. L. Jacobs (p. 110); [Bacteria in Relation to] Fasciation of Sweet Peas, by P. E. Tilford (p. 110); Dutch Elm Disease in Dead and Dying Elms, by R. P. True and E. T. Miller (pp. 110, 111); Chlorosis of Rice Induced by Iron Deficiency, by E. C. Tullis and E. M. Cralley (p. 111); Pathogenicity of *Sclerotium rolfsii* for Young Apple Trees, by T. W. Turner (p. 111); Hybridization Between *Sphacelotheca cruenta* and *Sorosporium reilianum*, by S. Vaheeduddin (p. 111); A Method for Describing Strains of Tobacco Mosaic Virus, by W. D. Valleau (pp. 111, 112); Resistance of Potato Varieties to Infection by the Veinbanding Virus, by C. L. Vincent and L. K. Jones (p. 112); Resistance to Club Root [*Plasmodiophora brassicae*] in Brassica, by J. C. Walker (p. 112); Histological Changes in Resistant and Susceptible Strains of Maize Infected With *Phytomonas stewarti*, by E. J. Wellhausen (pp. 112, 113); Parasitism of the Apple Leaf Hopper, *Typhlocyba pomaria*, by *Entomophthora*, by S. A. Wingard (p. 113); Some Pathological Problems in Connection With the Development of the Plains Shelter-Belt Project, by E. Wright (p. 113); Downy Mildew [*Pseudoperonospora humuli*] of Hops, by C. E. Yarwood (pp. 113, 114); and A Pea Streak Caused by Alfalfa Mosaic, and Pea Mosaic and Its Relationship to Other Legume Viruses, both by W. J. Zaumeyer and B. I. Wade (p. 114).

The Plant Disease Reporter, May 15, 1936 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 20 (1936), No. 9, pp. 141–153, fig. 1*).—Among other items of current interest are the following: Survey of tobacco plant bed diseases in Georgia, 1936, by J. G. Gaines; an unusual occurrence of "spotted wilt" of tomato in Utah, by H. L. Blood; diseases rare in early plantings of English peas in Mississippi, 1936, by P. R. Miller; stem nematode causing damage to alfalfa in Arizona, by D. C. George (with identification as *Anguillulina dipsaci* and *Cephalobus elongatus*, by G. Steiner); peach virus diseases in Michigan in 1935 (including yellows, little peach, red suture, and rosette); winter and freezing injury to fruit in Illinois, by H. W. Anderson; Dutch elm disease eradication (modifications in quarantine regulations); and the following new fungus records: *Ascochyta clematidina* on *Clematis ligusticifolia* at Corvallis, Oreg. (apparently a first record for the West); *Colletotrichum fuscum* on *Digitalis purpurea* at Toledo, Oreg.; *Gloeosporium caulivorum* on *Trifolium pratense* at Creswell, Oreg. (new for the west coast); *Uromyces caryophyllinus* on *Dianthus caryophyllus* (apparently a new record for Alaska); *U. scirpi*, aecial stage on *Daucus carota*, Corvallis, Oreg. (apparently a first record for a rust on carrot in the United States); and *Septoria unedonis* on *Arbutus unedo* at Corvallis, Oreg. (apparently a new record for this fungus in the United States).

[Phytopathological studies by the Massachusetts Station] (*Massachusetts Sta. Bul. 327 (1936), pp. 13–16, 23–27, 28, 33–35*).—Progress reports are given on studies of black root rot resistant strains of tobacco, by C. V. Kightlinger (in cooperation with the U. S. D. A. Bureau of Plant Industry); control of greenhouse tomato diseases and disinfection of greenhouses, by E. F. Guba; vegetable seed treatments, by C. J. Gilgut; causes and control of decay of winter squash in storage, by Guba and Gilgut; diseases of herbaceous ornamental plants caused by soil-infesting fungi and their control, and damping-off and growth of seedlings and cuttings of woody plants as affected by soil

treatments and modifications of environment, both by W. L. Doran; control of apple rust (*Gymnosporangium juniperi-virginianae*), by Gilgut; Dutch elm disease survey of Massachusetts, by A. V. Osmun and M. A. McKenzie; testing plants for nitrogen deficiency with diphenylamine, by L. H. Jones; bordeaux mixture (5–5–50) v. basic copper sulfate with Wyo-Jel on potatoes, by W. S. Ritchie; and cranberry investigations in cooperation with the U. S. D. A. Bureau of Plant Industry (including the development of strains of cranberry resistant to false blossom, oxygen content of flooding water in relation to injury to cranberry vines, spraying and dusting experiments, and storage tests in relation to cranberry rots and their control, all by H. F. Bergman and W. E. Truran).

[Phytopathological studies by the New Hampshire Station] (*New Hampshire Sta. Bul. 289 (1936), pp. 13, 14, 15*).—Progress reports are given on studies of lime-sulfur injury to beans and to apple foliage, bitter pit in apples, and of the effect of place on mosaic and leaf roll of potatoes, all by O. Butler; and of apple scab, by Butler, E. J. Rasmussen, and S. Dunn.

[Phytopathological work by the North Dakota Station] (*North Dakota Sta. Bul. 286 (1935), pp. 34–38, figs. 3*).—Progress reports are given on barberry eradication work in North Dakota, by G. Mayone; and on studies of potato virus diseases, seedling diseases of barley, smuts of wheat, and ergot of grains and grasses, by W. E. Brentzel.

Plant diseases [studied by the Wisconsin Station] (*Wisconsin Sta. Bul. 435 (1936), pp. 100–115, 131–133, figs. 4*).—Progress reports are given of the following studies: Virus diseases of canning peas, by M. W. Stubbs and J. C. Walker; mosaic-resistant canning beans in commercial trials, by Walker; survey distribution of tomato diseases, by Walker and O. C. Whipple; large selection of yellows-resistant cabbage varieties now available, by Walker and L. M. Blank; no relation between clubroot resistance and volatile oil content of cruciferous plants, by Walker, K. P. Link, and S. Morell; high temperatures favor yellow dwarf of potatoes, by Walker and R. H. Larson; soil treatment and green manuring in combating potato scab, by A. R. Albert, Walker, and Larson; blackening in cooked potatoes associated with potash deficiency, by W. E. Tottingham; breeding of wilt- and cold-resistant alfalfa, by R. A. Brink and F. R. Jones; factors affecting seed production in alfalfa, by H. R. Albrecht, D. C. Cooper, and Brink; resistance of corn to bacterial wilt, by S. S. Ivanoff, A. J. Riker, and J. G. Dickson; collapse of corn seedlings due to excessive nutrient material in the soil, by Riker, R. O. Magie, and Dickson; seed treatment and careful soil preparation needed for control of barley diseases, by Dickson, R. G. Shands, H. L. Shands, and H. Johann; bordeaux mixture continues to give favorable results in the control of cherry leaf spot, by G. W. Keitt and E. C. Blodgett; relation between pathogenicity of crown gall bacteria and viscosity of gums produced by them, by Riker, T. O. Berge, and I. L. Baldwin; physiological studies of pathogenic and nonpathogenic crown gall bacteria, by Riker, M. M. Lynis, and S. B. Locke; nitrogen metabolism of pathogenic and nonpathogenic crown gall and of hairy root bacteria, by Riker, H. A. Conner, and W. H. Peterson; lime-sulfur again gives most effective control of apple scab in 1935, by Keitt, Blodgett, and J. A. Pinckard; copper-lime-arsenite mixtures continue to show promise against apple scab, by Keitt and D. H. Palmiter; the cause of tobacco "streak" disease determined to be a virus, by J. Johnson; plants may acquire immunity to viruses; and the manner in which tobacco mosaic virus overwinters in the soil, by Johnson and I. Hoggan. Several of the studies were in cooperation with the U. S. D. A. Bureau of Plant Industry.

To the methods of the isolation of phytopathogenic bacteria, V. D. LIBEZHINSKAÏA (*Mikrobiologiïa, 4 (1935), No. 2, pp. 254–257; Eng. abs., p. 257*).—It is reported that warm water gave better results than alcohol in the preliminary treatment of material used for inoculation. Mercuric chloride (1–1,000) proved the most active of the disinfectant materials tested. Under the conditions used, the Omeliansky medium plus glucose was most suitable for the isolation of phytopathogenic bacteria, and the addition of gentian violet (1–10,000) improved it. Preliminary grinding of the pathological material in a mortar with sterile water raised the percentage of positive results.

The lytical action of soil bacteria on parasitic fungi, ÏA. P. KHUDÏAKOV (*Mikrobiologiïa, 4 (1935), No. 2, pp. 193–204, figs. 7; Eng. abs., p. 204*).—A species of *Pseudomonas* and one of *Achromobacter* capable of lysing various species of *Fusarium* and some other fungi were studied, and a rapid method of isolation is described. Bacteria capable of lysing Fusaria are reported to be widespread in various soils, but in many cases no such forms could be found. *Fusarium*-lysing bacteria are stated to be lacking in some flax-sick soils, and it is suggested that the abundance of Fusaria in these soils is connected with their absence.

Fusaria introduced into soils containing active lytic bacteria failed to develop, and artificial infection of such soil with Fusaria did not result in plant infection. When sterilized soil was infected with Fusaria, lytic bacteria introduced simultaneously or 24 hr. earlier protected wheat from infection. When the lytic bacteria were introduced 24 hr. after the Fusaria, they proved unable to protect against the infection of wheat sown 3 days after the bacteria.

The relation of temperature to the effect of hydrogen- and hydroxyl-ion concentration on Sclerotinia fructicola and Fomes annosus: Spore germination and growth, P. E. TILFORD (*Ohio Sta. Bul. 567 (1936), pp. 27, figs. 6*).—An intimate relation was found between temperature and the limits of pH for germination of *S. fructicola* after 24 hr., the widest reaction range (from pH 1.4 to 7.2) occurring at 21° C. The temperature limits were also influenced by the reaction. The optimum pH for germination was not materially affected by temperature, being near pH 2.4 at all temperatures tried except for 33°, where best germination occurred at pH 5.6. On the other hand, pH influenced the optimum temperature. Double maxima germination curves occurred for every temperature tried, the minimum being at pH 6.0.

Both fungi produced large amounts of acid on potato dextrose and malt agars, and the growth curves for both were, in general, straight lines when the lag phase was ignored. The pH limits for growth were influenced by temperature, the pH range being widest at the most favorable temperatures. The temperature limits were also influenced by the pH of the media. The efficiency of the fungi in producing a given amount of radial growth depended on the medium, the pH, and the temperature. *S. fructicola* proved more efficient on potato dextrose agar, and *F. annosus* on malt agar. In general, the reaction of the media most favorable to mycelial growth was inconstant when the temperature varied. There was a shift to a less acid reaction at the higher temperatures, at which also the optimum pH for mycelial growth was higher than at the lower temperatures and higher than for spore germination in *S. fructicola*. The temperature coefficients, as calculated for growth rates of the two fungi on the respective media noted and for the different pH values, varied greatly throughout the temperature range, being largest for the lower portion and smallest for the higher portion of the range.

The H ion proved much less toxic than the OH ion. There was also indication that the H ion was more toxic at the upper than at the lower temperature limits for growth, while the reverse was apparently true for the OH ion.

Availability of the copper of bordeaux mixture residues and its absorption by the conidia of Sclerotinia fructicola, M. C. GOLDSWORTHY and E. L. GREEN (*Jour. Agr. Res.* [*U. S.*], *52* (*1936*), *No. 7, pp. 517–533, fig. 1*).—This is a study of the effect on conidia of germinating them in contact with spray residues on glass cover slips. After spraying, the slips were subjected to aging and weathering before testing. The sodium salt of nitroso-chromotropic acid was used to demonstrate the presence of copper inside conidia and in their environment. Weathering reduced the toxicity of bordeaux mixture residues noticeably before the total quantity of copper was much impaired, indicating that the residue may contain copper in both available and unavailable conditions. The latter serves to replenish available copper between rains. Copper was generally distributed inside the cells of killed conidia. Absorption took place only on the beginning of germination, but at such an early stage that no evidence of growth was visible. Individual conidia of a given sample do not begin germination together. Available copper was absorbed by germ tubes as readily as by conidia and with the same lethal effect. Germinated conidia, washed to free of staling products, absorbed lethal amounts of copper in the same manner as unwashed cells from bordeaux mixture.

"It is concluded that in freshly deposited bordeaux mixture residues there is present a component bearing available copper which is exhausted by washing with rains but not by aging. After it is lost, conidia that come to rest in contact with the residue are inhibited in germination but are not killed, and can germinate freely when removed from this contact. While it is still present, conidia take up copper before any visible evidence of vital activity is observed. From this it appears that the conidial cells are not capable of secreting a substance which will dissolve the inert copper of these washed residues."

Recent lime-sulphur investigations, R. E. TRUMBLE (*Wash. State. Hort. Assoc. Proc., 31 (1935), pp. 99–105*).—This is a general review of recent investigations on lime-sulfur solutions as fungicides and insecticides, with recommendations.

Experiments on the control of cereal smuts by seed treatment, W. F. HANNA and W. POPP (*Sci. Agr., 15 (1935), No. 11, pp. 745–753; Fr. abs., p. 753*).—During the period 1930–34, 37 preparations were tested in field experiments for smut control, and the results with 16 of them are here tabulated.

Formalin gave satisfactory control of wheat bunt, barley covered smut, and oat smuts, but, though relatively cheap, it is more difficult to apply than the dusts and may cause seed injury. The copper dusts are recommended only for treatment of wheat and hull-less oats, in general giving good control of bunt when the seed is not too heavily contaminated. New Improved Ceresan was effective against wheat bunt, barley covered smut, and oat smuts, and because of the light rate of application it should not clog the drills. In certain tests, the results of which are not detailed here, seed treated with copper and mercury dusts gave a higher percentage of seedling emergence than the untreated seed.

Organic mercury dusts, because of their effectiveness and ease of application, appear to be replacing liquid treatments and copper dusts in the control of the cereal smuts.

Inheritance of chlamydospore characteristics in oat smut fungi, C. S. HOLTON (*Jour. Agr. Res.* [*U. S.*], *52* (*1936*), *No. 7, pp. 535–540*).—In hybrids between the various oat smut fungi (*Ustilago avenae*, spores brown and echinulate, *U. levis*, spores brown and smooth, and the buff smut fungus, spores hyaline and echinulate) factors for echinulate and brown chlamydospores were dominant over factors for smooth and hyaline chlamydospores.

The F_2 population of the hybrid *U. levis* × buff smut was distributed in a ratio of 3 brown to 1 hyaline, and in the hybrid *U. avenae* × *U. levis* the distribution was in a ratio of 3 echinulate to 1 smooth.

The F_2 population of the hybrid *U. avenae* × buff smut was distributed in a ratio of 9 brown echinulate to 3 brown smooth to 4 hyaline smooth. This distribution seems to indicate that the presence of an inhibitor prevents the expression of echinulation in the hyaline chlamydospores.

Black chaff disease of wheat, R. H. BAMBERG (*Jour. Agr. Res.* [*U. S.*], *52 (1936), No. 6, pp. 397–417*).—The paper presents a study in cooperation with the Minnesota Experiment Station of the factors influencing the growth of *Bacterium translucens undulosum* and of those affecting the development of epidemics caused by it. The cardinal temperatures for the organism in culture are from 5° to 10°, from 25° to 30°, and approximately 40° C. The incubation period was distinctly shorter, and the lesions caused in a given time were larger at 20° or above than at 10°, although the percentage of plants becoming infected was about the same. The organism remained viable in soil cultures exposed for 124 days after December 15, during which time the temperature dropped to —33.3°. An atmospheric relative humidity of 50 percent or lower around cultures retarded growth. The organism enters the host through stomata and wounds and develops both inter- and intracellularly. While all aerial parts of susceptible wheats may be attacked, some varieties are more often infected at the lower nodes of the culms and others in the heads and necks of the culms. Susceptibility varies considerably among varieties, but resistance is only relative, all varieties tested becoming infected to some degree under certain conditions. The host range includes oats, einkorn, *Hordeum jubatum*, and *Bromus inermis* in addition to wheat, barley, rye, and spelt, previously described as hosts. There are strains of the organism that differ in cultural and physiological characters and in pathogenicity.

Stripe rust, Puccinia glumarum, in Canada, M. NEWTON and T. JOHNSON (*Canad. Jour. Res., 14 (1936), No. 2, Sect. C, pp. 89–108, fig. 1*).—Unlike *P. graminis*, this rust was found to be confined to British Columbia, Alberta, and the western half of Saskatchewan. The natural hosts included a number of native grasses, particularly *Hordeum jubatum*, and species of *Agropyron*, *Elymus*, and *Bromus*. Wheat and barley were infected to a limited extent.

Stripe rust collected on the above hosts and studied in the greenhouse was in all cases able to attack wheat varieties. Whatever identification of physiologic forms was made the strains were classified as either form 8 or 13 of wheat stripe rust, the latter form being the more common. The facts that the authors have collected known physiologic forms of wheat stripe rust on species of *Hordeum*, *Elymus*, and *Agropyron* and that they have shown that forms 4, 6, 8, and 13 can attack seedlings of species of these three genera throw doubt on the existence of the varieties *hordei*, *clymi*, and *agropyri* of J. Eriksson.

P. glumarum proved extremely sensitive to environmental conditions, and particularly to temperature. The optimum for urediospore germination was from 10° to 12° C. and for rust development from 13° to 16°. Varieties susceptible at from 10° to 16° developed resistance at higher temperatures, becoming extremely resistant at 25°. Because of the sensitiveness of this rust to high temperatures, it seems improbable that it will ever become thoroughly established in Manitoba and Saskatchewan, since their summer temperatures are probably too high for its development.

Relative resistance to bacterial wilt of certain commercial and selected lots of alfalfa, J. L. WEIMER and B. A. MADSON (*Jour. Agr. Res.*

[*U. S.*], *52 (1936), No. 7, pp. 547–555*).—In this cooperative study by the California Experiment Station and the U. S. D. A. Bureau of Plant Industry, alfalfa (*Medicago sativa*) plants produced from 39 different commercial or selected lots of alfalfa were tested for resistance to bacterial wilt (*Phytomonas insidiosa*) at Delhi and Davis, Calif. Seedlings from 4 to 8 mos. old, grown in the greenhouse or in the field, were inoculated by immersing wounded roots in a bacterial suspension. The plants were then set in the field and grown for several months, after which they were examined and the healthy ones reinoculated. Seeds were obtained from the plants withstanding the double inoculation, and the resistance of the new generation was tested.

The results confirm those of other workers in that the Turkistan, Hardistan, and Ladak alfalfa seed lots contained the highest percentage of resistant individuals. A few plants of some of the other seed lots survived the two inoculations, and their progenies are being tested. For the most part, progenies of plants surviving two inoculations gave a somewhat higher percentage of resistant individuals than did the original stock.

Field studies on the bacterial wilt of alfalfa, J. S. WIANT and G. H. STARR (*Wyoming Sta. Bul. 214 (1936), pp. 20, figs. 4*).—Most of the alfalfa losses reported in the State were found to be due to a gradual thinning out of the stands by the widespread *Phytomonas insidiosa*. There was no evident relationship between bacterial wilt and either available soil phosphorus or soluble soil salts, but increases in wilt incidence were always associated with increased percentages of plants with winter injury lesions.

No practical mode of control, other than the use of resistant varieties, appears to be available.

The effect of temperature on the growth of Fusarium vasinfectum Atk., M. MITRA and K. F. KHESWALLA (*Indian Acad. Sci. Proc., 2 (1935), No. 6, Sect. B, pp. 495–499, fig. 1*).—*F. vasinfectum*, causing cotton wilt in Western India, was found to have an optimum temperature of about 25° C. when grown in fluid or solid media. The minimum appeared to be a little below from 13° to 14° and the maximum between 35° and 40°.

Sclerotinia rot of squash and pumpkin, P. A. YOUNG (*Phytopathology, 26 (1936), No. 2, pp. 184–190, figs. 2*).—Natural and artificial inoculations with *S. sclerotiorum* at the Montana Experiment Station caused a wet rot of pumpkin fruits and a dry rot of squash fruits, producing abundant white mycelium and many large, black sclerotia in the fruits. In pumpkin it produced sclerotia from 0.5 to 15.5 cm long, which in turn produced apothecia when planted in sand. This *Sclerotinia* was isolated from naturally infected squashes and pumpkins, inoculated into healthy squashes and pumpkins in which it caused typical rot, and reisolated from these artificially inoculated and rotting fruits.

Bean, carrot, celery, lettuce, pea, potato, Shasta daisy, white sweetclover, yellow sweetclover, and zinnia were reported as new hosts in Montana. The known hosts, listed with citations, belong mostly to the Compositae, Cruciferae, Cucurbitaceae, Chenopodiaceae, Leguminosae, Solanaceae, and Umbelliferae.

Investigations on the control of seedling diseases of sugar beet, W. HUGHES (*Roy. Dublin Soc. Sci. Proc., n. ser., 21 (1935), No. 22, pp. 205–212*).—Using seeds of the Kühn P variety with 12 percent of the clusters visibly affected with *Phoma betae*, trials were made of the comparative effectiveness of bulk seed treatment before shipping v. treatment in small lots just before sowing and of various disinfectants, dusts, and liquids, applied just before sowing.

None of the treatments used stimulated or increased the percentage of germination, but the bulk treatment caused a notable reduction, due probably to a

too prolonged contact between the seed and the disinfectant. In a randomized field experiment, statistically analyzed, the following materials gave significant increases in the numbers of seedlings over the controls: Germisan and Ceresan 27.6 percent, Granosan 25.6 percent, and old Ceresan 21.7 percent. The other treatments, including the seed producers' bulk treatment, were not significantly better than the controls.

Disinfection of the seed in small lots just before sowing gave better results than the bulk treatment. The increase in number of seedlings was attributed to the effect of the disinfectants on *P. betae.*

The yellowing disease of sugar beets and its cause [trans. title], D. A. VAN SCHREVEN (*Meded. Inst. Suikerbieten., 6 (1936), No. 1, pp. 36, figs. 7; Fr. abs., pp. 31–34*).—A brief review is given on the principal chlorotic diseases of sugar beets in Europe, including the physiological and virus theories of the yellowing disease. The author investigated both of the possibilities regarding the cause of the latter disease, implicating a virus which was experimentally transmitted by *Aphis fabae.*

Copper deficiency in sugar beets [trans. title], D. A. VAN SCHREVEN (*Meded. Inst. Suikerbieten., 6 (1936), No. 2, pp. 37–57, figs. 4; Fr. abs., pp. 53, 54*).—The nutrient solutions were first tested for the absence of copper by growing oat seedlings therein. In these solutions the sugar beet seedlings showed the first visible signs of injury in about 19 days, through a slight chlorosis which increased little by little and usually spread from the tip until the whole leaf took on a marbled appearance. The heart leaves were not chlorotic. In about 2 mo. the oldest chlorotic parts became necrotic in localized areas of the parenchyma, which turned grayish brown, gray, or white. Affected leaves were usually thinner than normal and produced little or no starch. It is concluded that copper plays an essential role in the functioning of chlorophyll, as is true for hemoglobin.

The copper deficiency disease is thus to be classed in the chlorotic group of sugar beet diseases, the more important of which have been previously described by the author (see above).

Diseases of sugar beets in Louisiana, C. W. EDGERTON and E. C. TIMS (*Louisiana Sta. Bul. 273 (1936), pp. 12, figs. 5*).—Sugar beets grown in Louisiana have been seriously affected with a number of diseases, but the *Rhizoctonia* and *Sclerotium* rots appeared to be the limiting factors when an attempt was made to grow beets commercially in 1926 and 1927. The former disease was most severe (with losses sometimes as high as 50 percent) in the wet, cold weather of late winter and early spring, and practically disappeared with the approach of warm weather. The *Sclerotium* rot became serious when the beets were left in the field in warm weather, and it was also favored by moisture. The damage occurs not only in the field, but heavy losses may follow during transportation. Methods of control (fertilizers, lime, and varietal reactions) for the *Sclerotium* rot have not yet proved successful.

Of the two leaf spots, that due to *Cercospora beticola* is serious during warmer weather and may materially reduce the crop, while *Phoma betae* is apparently of minor importance and does not cause rotting of the beets. The nematode *Caconema radicicola* will doubtless become important if beets are grown commercially in sandy soils.

Virus diseases of plants: Purification of the virus of mosaic disease of tobacco, C. G. VINSON (*Missouri Sta. Res. Bul. 237 (1936), pp. 16*).—About 12,000 tobacco plants were used in the tests here reported. With increasing concentrations of safranine, tobacco mosaic virus from juice was progressively carried down until precipitation was about complete. Acetone precipitation of

the virus in the fraction obtained on decomposing the safranine precipitate did not prove satisfactory, but reprecipitation of the virus was successfully performed. A few drops of normal solution of aluminum sulfate sufficed to precipitate the virus from the fraction obtained on decomposing the safranine precipitate, and careful acidification also precipitated the virus from such a fraction. Such precipitates may be readily dispersed by lowering the H-ion concentration. About 10 mg was the nitrogen content of the virus fraction obtained from 500 cc of juice of mosaic tobacco plants by the lead acetate procedure. Very little or no nitrogen was detectable in corresponding samples from the juice of healthy plants. Hydrogen sulfide apparently may be used to decompose the lead virus precipitate when suspended in a dilute solution of neutral phosphate. After standing for 6 mo. the lead and safranine precipitates still yielded highly infectious fractions.

The occurrence and prevention of the apple canker due to Nectria galligena in southern Estonia [trans. title], A. KIVILAAN (*Agronoomia, 15 (1935), Nos. 10, pp. 437–456, figs. 14; 11, pp. 491–510, figs. 4; 12, pp. 557–566*).—This is a general review of known facts relating to this disease, with added local data.

Apple measles, A. B. GROVES (*Va. Fruit, 24 (1936), No. 2, pp. 28, 29, 30, fig. 1*).—This general account of the disease is from the Virginia Experiment Station.

Apple scab and spray injury, W. C. DUTTON (*Amer. Pomol. Soc. Proc., 49 (1933), pp. 11–17*).—In this contribution by the Michigan Experiment Station it is stated that scab epidemics are closely correlated with weather conditions which cannot be known in advance, so that to insure clean fruit yearly spraying is necessary.

To avoid spray injury in Michigan the season is divided into the prebloom and postbloom periods. The first is most important for scab control and least for spray injury, and it is thus recommended to spray frequently and thoroughly with effective materials during this period—the growth rate and rainfall determining the number and frequency of applications (from two to four). By concentrating on the prebloom period, primary infections of leaves and fruits are largely prevented.

The results of tests led to the recommendation of lime-sulfur or its equivalent in one of the effective substitutes. Four lb. or more or dry lime-sulfur are required to equal 1 gal. of commercial lime-sulfur (32.33° Baume) in scab control. Tests in 1932 and 1933 indicated that about the same relation holds between flotation sulfur (dry wettable) and liquid lime-sulfur.

Mottle leaf of cherries, E. L. REEVES (*Wash. State Hort. Assoc. Proc., 31 (1935), pp. 85–89, figs. 2*).—The history of the disease is briefly given, and the symptoms are described. Observations indicated considerable apparent differences in the quality of the fruit on affected trees, varying with the variety, the duration of the disorder, and the amount of fruit on the tree. The terminal growth on such trees was much lower than normal.

The results of experiments to determine the nature of mottle-leaf proved that it is due to an infective principle thus far only known to be transmissible from diseased to healthy trees by budding and grafting.

The anthracnose of currant and gooseberry caused by Pseudopeziza ribis, E. C. BLODGETT (*Phytopathology, 26 (1936), No. 2, pp. 115–152, pls. 3, figs. 6*).—Anthracnose is considered the most widespread and destructive disease of cultivated *Ribes*. As a result of this study at the Wisconsin Experiment Station it was found that isolates of the fungus from Wisconsin, Oregon, Canada, and a culture from Europe differed consistently in several morphological

and physiological characters. A method was used for measuring curved spores, and measurements for several isolates are presented. The optimal temperature for germination of conidia was about 20° C., for ascospores about 12°, and for growth on solid media about 20°. Isolates as cultured at from 4° to 28° varied greatly in their rates of growth. Conidial production was greatest at about 20° to 24° and microconidial at about 8° to 16°. Ascospores were discharged from leaves at from 1° to 32°. The optimal pH for conidial germination and for growth under the conditions studied was between 5.4 and 7.0, conidial production was greatest at pH 4.0, and microconidia were abundant where growth occurred. *Ribes* leaves tested on three dates varied from pH 5.0 to 7.0.

Infection studies on several varieties of potted plants and excised leaves, using conidia and ascospores, showed all isolates to be pathogenic but in different degrees. Spores from currants were more pathogenic on currants than on gooseberries, and vice versa. Infection occurred with a moist period of 12 hr. or more after inoculation, and approximately 20° was the optimal temperature. Plants held at higher temperatures prior to inoculation were more susceptible than those held at lower temperatures. Penetration by conidia or ascospores was direct on either leaf surface. Appressoria may be formed. Development of the fungus during fall, winter, and spring was followed in sectioned preparations and by field observations. Primary infection is initiated by ascospores, by conidia formed in the spring, and probably by conidia formed in the fall. Mature ascocarps were produced on overwintering leaves in the refrigerator by March 1. Overwintered leaves stored for 11 mo. at 4° showed viable ascospores. The perfect stage on *Ribes grossularia* is reported for the first time. A graphic summary of data on host, fungus, and disease development in relation to meteorological records at Sturgeon Bay, Wis., is given for 1933 and 1934. Comparative susceptibility of varieties depends largely on environmental factors.

Experiments at Sturgeon Bay (1932–34) indicated that bordeaux mixture (3–4–50) gives good control when thoroughly applied (1) just before bloom, (2) just after fruit set, (3) 3 weeks later, and (4) just after harvest. Lime-sulfur (1–40) in the same program was less effective but proved highly efficacious in the control of powdery mildew [*Sphaerotheca mors-uvae*]. A mixed program, in which lime-sulfur was used for the first two sprays and bordeaux for the later ones, gave good control of both anthracnose and mildew, with less injury to the host.—(*Courtesy Biol. Abs.*)

The identity of raspberry mosaics, L. M. Cooley (*Phytopathology, 26 (1936), No. 1, pp. 44–56, fig. 1*).—In this study from the New York State Experiment Station, field evidence and inoculation experiments proved the "mild mosaic" prevalent in the Columbian hybrid raspberry to be the expression of a true virus infection and the virus concerned to be identical with the red raspberry mosaic virus. Symptom developments on indicator black raspberry plants showed that this single virus may produce all the mosaic types, other than yellow mosaic, that occur in raspberries in eastern North America, thus supporting the theory that there are but two viruses involved in the raspberry mosaics of this region. For reasons of clarity, it is proposed that the red raspberry mosaic virus be renamed "green mottle mosaic."—(*Courtesy Biol. Abs.*)

Spraying experiments for the control of certain grape diseases, K. W. Loucks (*Florida Sta. Bul. 294 (1936), pp. 16, fig. 1*).—The tests reported were initiated to determine a spray schedule that would insure a marketable crop without particular attention to diseases attacking the canes and foliage. How-

ever, it was observed that the sprayed vines retained their leaves much longer after harvest than the controls, that in the following year foliage diseases appeared first on vines not sprayed the year before, and that the vines with heaviest black rot infection on the early leaves also bore the heaviest black rot infection on the fruit.

Of the various materials tested bordeaux mixture showed the most effective control of the fruit rots, and the addition of wetting or sticking agents gave no improvement. For the best results, it was found necessary to spray during the blooming and fruit setting period. When the growth rate was slow, resulting in a longer growing season, more applications were needed than during a short growing season, as the fruit and foliage must be kept covered with fungicide throughout the growing period. Bitter and ripe rots proved more difficult to control than black rot, perhaps due to the more frequent rains during ripening, when the former rots appear. However, because of the residue from bordeaux mixture, it appeared advisable to use stainless sprays as the fruits approached maturity, and it is possible that the copper acetate used during the latter part of the season is less effective than bordeaux against the bitter and ripe rots.

Based on the results of these tests, a spray schedule for the control of grape diseases in Florida is presented.

Inoculation of rabbits with Elsinoe ampelina, A. E. JENKINS and L. T. GILTNER (*Phytopathology, 26 (1936), No. 2, pp. 191–194, fig. 1*).—As a repetition of an experiment performed in 1905 (E. S. R., 18, p. 152), in which infection of rabbits with a culture of this grape (*Vitis*) pathogen, was reported, two different experiments were conducted in each of which two rabbits were given subcutaneous inoculation, two intraperitoneal, and two intravenous, with a known culture of this fungus. Autopsies made from 3 to 8 weeks afterward revealed no lesions attributable to the inoculated organism. Cultures of the *Elsinoe* were killed when held for 10 days at 37.5° C., or slightly below the body temperature of the rabbit. It is suggested that if the inoculum employed in the previous experiments caused the lesions described it was not pure for the *Elsinoe*, and evidence is given to show the likelihood of such impurity.

The biology of Ganoderma lucidum on areca and cocoanut palms, S. V. VENKATARAYAN (*Phytopathology, 26 (1936), No. 2, pp. 153–175, figs. 6*).—This very common tropical fungus causes a brown rot of the roots and stems of areca and coconut palms. Isolates were studied in culture. Enzyme studies and pH relations are reported for the areca strain. Both isolates appeared, from the results of artificial inoculations, to be very slowly active parasites on their respective hosts.

The breeding of stock for Citrus sinensis immune to Phytophthora parasitica, the cause of "gum disease" in Java [trans. title], H. J. TOXOPEUS (*Züchter, 8 (1936), No. 1, pp. 1–10, figs. 3*).—The author describes the materials and methods of crossing by which he obtained and tested the immune stocks described. The hybrid stocks may be increased by vegetative propagation.

Present generic status of the citrus-scab organism, A. E. JENKINS (*Phytopathology, 26 (1936) No. 1, pp. 68–70, fig. 1*).—*Sphaceloma fawcettii*, causing citrus scab, is undoubtedly to be classified in the genus *Sphaceloma* where it was placed by the author in 1925 (E. S. R., 57, p. 852). It had been classified a short time before in the genus *Sporotrichum* as similar to such animal pathogens as *S. schenckii*. *Sphaceloma fawcettii* is clearly distinct from *Sporotrichum roseum*, the type species of the genus *Sporotrichum*, and a parallel comparison with *S. schenckii* demonstrates the two to be unlike. There is, therefore, no reason to believe that the citrus scab pathogen is related to the genus containing the human pathogen named.

Australian citrus scab caused by Sphaceloma fawcettii scabiosa, A. E. JENKINS (*Phytopathology, 26 (1936), No. 2, pp. 195–197, fig. 1*).—Authentic specimens of *Ramularia scabiosa* McAlpine and Tryon, which H. Tryon reported in 1889 as causing a scab of citrus in Queensland and which is evidently the scab disease discovered there in 1876, are identical with the *Sphaceloma* on a specimen of citrus scab obtained from New South Wales in 1926. As compared with what is now known as *S. fawcettii* Jenkins, which D. McAlpine referred to (E. S. R., 12, p. 654) as existing in Florida but not in Australia, the Australian fungus has larger conidia (often 10μ–17μ×2.5μ–4μ) and conidiophores and produces larger, more regularly discoid or crateriform lesions. It is reclassified as *S. fawcettii scabiosa* (McAlpine and Tryon) Jenkins. Other reports of scab in Australia (cited) may be the form discussed.—(*Courtesy Biol. Abs.*)

Some storage diseases of grapefruit, C. BROOKS and L. P. MCCOLLOCH (*Jour. Agr. Res. [U. S.], 52 (1936), No. 5, pp. 319–351, pl. 1, figs. 9*).—Descriptions are given of two forms of pitting and of scald, oleocellosis, browning of the oil glands, and watery break-down of grapefruit. Bacteria were readily isolated from the pitted tissue, but were not considered the fundamental cause Pitting was often bad in 32°, 36°, and 40° F. storage, but was practically eliminated by holding the fruit at 50°. Delayed storage and removal of the fruit from low temperature storage to higher temperatures for short periods during the first weeks of storage resulted in a decrease in pitting. Pitting was also decreased by high humidity in the storage atmosphere, by the use of paraffin, cellophane, and heavily oiled wrappers; by coating the fruit with wax-mineral oil mixtures; and by prestorage exposure to carbon dioxide. Scald and water break-down were confined largely to 30° and 32° storage.

Holding the fruit at 50° after from 1 to 2 weeks of storage at a lower temperature practically eliminated the physiological disorders, but at 50° fruit soon developed a very high percentage of stem-end rot, whereas that held at 40° or below usually showed no decay under 8 weeks of storage.

Pathogenicity and variation in Phytophthora species causing heart rot of pineapple plants, F. P. MEHRLICH (*Phytopathology, 26 (1936), No. 1, pp. 23–43, figs. 2*).—In this contribution from the [Hawaiian] Pineapple Producers' Station, the record of the world distribution of pineapple heart rot is extended and brought up to date. Isolations made in Hawaii over a 3-yr. period indicated the presence of *P. parasitica* on all of the islands, *P. cinnamomi* over a distance of 30 miles on a single drainage slope of Oahu only, and *P. palmivora* in a limited area on Oahu only.

Detailed evidence is presented for considering *Pseudopythium phytophthoron* as a strain of *Phytophthora cinnamomi*.

Variations were demonstrated, within the three heart-rotting species, of a nature recognized in the rust fungi as physiological strains. Therefore, doubt is cast on the validity of separating species of *Phytophthora* on the basis of the differential susceptibility of a single host.

Because of essential similarities shown to exist between the species *P. cinnamomi* and *P. cambivora*, it is suggested that they be combined as a single species, within which strain differences may be recognized.

A number of *P. parasitica* isolates from heart rot lesions were more sensitive to high temperatures than strains studied by Tucker (E. S. R., 65, p. 841). His criterion for separating *P. parasitica* from *P. palmivora* does not seem reliable for these forms.

A green fruit rot of pineapples shown to be caused by *P. cinnamomi* and by *P. parasitica* is discussed. A relationship is shown to exist between pineapple

heart rot and the following: *Rhododendron* canker, bud rot of palms, foliage and fruit rot of rubber trees (*Hevea brasiliensis*), canker of cinnamon trees, and rots of some of the common weed, truck crop, and green manure plants used in pineapple fields.

The symbionts of Pseudococcus brevipes in relation to a phytotoxic secretion of the insect, W. CARTER (*Phytopathology, 26 (1936), No. 2, pp. 176–183, figs. 2*).—Continuing this series of studies (E. S. R., 69, p. 829), the mealybugs (*P. brevipes*) responsible for green spotting of pineapple leaves were transferred from the latter to *Panicum barbinode* and then back to pineapple after varying periods of time. The effect of feeding on the grass was to eliminate the green-spotting capacity from the mealybugs, and continued feeding on pineapple failed to restore this capacity.

Coincident with the loss of this green-spotting capacity was the disappearance of a rodlike symbiont from the mycetome of the insect. Evidence is presented that this symbiont is pleomorphic, passing from the rod shape into a coccus form under the influence of radically altered nutrition. The rod form was invariably present in green-spotting, the coccus form in non-green-spotting, mealybugs. The fact that the return of the bugs to pineapple after feeding on the grass did not result in a return of the green-spotting capacity is considered to be proof that the loss of this capacity in the first instance was not due merely to a changed food plant but to a radically changed physiology clearly associated with pleomorphism of the symbionts.

Diseases and pests of the rubber tree, BEELEY (*Planter, 16 (1935), Nos. 10, pp. 488–494; 11, pp. 518–523, figs. 4; 12, pp. 571, 572*).—This constitutes a compendium of present knowledge of the diseases and pests of the rubbertree.

Antirrhinum rust (Puccinia antirrhini) in western Germany [trans. title], H. ANDRES (*Ann. Mycol., 33 (1935), No. 5–6, pp. 353–356*).—The author describes the rapid spread of this rust in western Germany, the injuries induced, observations on the factors influencing its incidence, and notes on the fungus.

Zinc and other mineral constituents in relation to the rosette disease of pecan trees, A. H. FINCH (*Jour. Agr. Res. [U. S.], 52 (1936), No. 5, pp. 363–376, figs. 4*).—In this study by the Arizona Experiment Station, analyses were made of leaf and shoot tissues of healthy and rosetted pecan trees for total ash, silica, calcium, magnesium, iron, copper, and zinc. Some trees were treated prior to sampling by placing zinc sulfate in holes bored into the trunks or branches. Other treatments included girdling and defoliation.

The results supply further evidence that pecan rosette is to a considerable extent associated with an insufficiency of zinc for normal metabolism. Such factors as condition of growth, location in the tree, and exposure to light and heat may act with a reduced zinc content to cause the development of rosette symptoms. No evidence was found that any appreciable quantity of nonutilizable zinc is present in the tissue. Total ash and minerals generally (other than zinc) were higher in affected than in healthy tissue when shoots of similar growth character and position in the tree were compared. Translocation of zinc occurred in the xylem, and the principal movement was in an acropetal direction. A slower lateral and downward migration probably occurred.

Leaf diseases of shade trees, R. P. WHITE (*N. J. Agr., 18 (1936), No. 2, p. 4*).—This popular discussion is a contribution from the New Jersey Experiment Stations.

Fungi associated with tree cankers in Iowa.—I, Preliminary survey, J. C. GILMAN, G. L. MCNEW, and G. N. DAVIS (*Iowa State Col. Jour. Sci., 10 (1936), No. 2, pp. 151–153*).—Data are briefly summarized for 860 specimens

of canker material (representing 20 families, 36 genera, and 68 species of trees), on 713 of which fungus identifications were made. White pine appeared to be among the species most seriously threatened by disease, followed closely by green ash and the poplars. *Acer saccharinum* also seemed to be highly susceptible to fungus attack, while Scotch pine and American elm were comparatively free of disease.

A protective zone in red gum fire scars, G. H. HEPTING and D. J. BLAISDELL (*Phytopathology, 26 (1936), No. 1, pp. 62–67, figs. 2*).—The macroscopic and microscopic appearance of a hard, dark, gum-filled zone formed in the outer sapwood under fire scars in red gum (*Liquidambar styraciflua*) is described. The wood within this zone proved highly resistant to decay by two sapwood-rotting fungi and frequently appeared to be effective in preventing decay of the wood behind fire scars. Evidence is presented that its effectiveness in preventing decay is reduced if a tree is repeatedly burned.

The parasitism of Arceuthobium (Razoumowskya) campylopodum on Pinus jeffreyi, J. DUFRÉNOY (*Phytopathology, 26 (1936), No. 1, pp. 57–61, figs. 3*).—The haustoria of *A. campylopodum* were found to penetrate into the medullary rays of *P. jeffreyi*, causing hyperplasia and inhibiting the normal differentiation of the xylem elements in their immediate vicinity. The few isolated xylem vessels of the parasite terminated in close contact with those of the host, and the parenchymatous cells of the medullary rays in the vicinity of the haustoria had a number of small, elongated, or branching vacuoles, i. e., they showed the cytological pattern generally associated with the rapid translocation of solutes.—(*Courtesy Biol. Abs.*)

Observations on the production and germination of sporidia of Cronartium ribicola, R. R. HIRT (*N. Y. State Col. Forestry, Syracuse Univ., Tech. Pub. 46 (1935), pp. 25, figs. 8*).—Under prevailing meteorological conditions at Warrensburg, N. Y., teliospore age affected sporidium production largely through the number of sporidia that might be produced under favorable conditions. Direct contact with water was not essential for teliospore germination, but relative humidities of from 96 to 100 percent were required at from 12° to 16° C. From 12° to 18° was the optimum range for sporidium production, and from 0° to 1° and 21° were the minimum and maximum temperatures, respectively. Teliospores were still viable after 8 hr. of direct sunlight, but the time required for sporidium production was increased. Sporidia were expelled with sufficient force to carry them an average horizontal distance of 266μ. They germinated (1) by producing secondary sporidia, and (2) by developing true hyphae. The type of germination was influenced largely by the temperature. Though sporidia germinated at relative humidities as low as 97 percent, contact with water was required for best germination. When not in direct sunlight they remained viable under natural conditions throughout 8 hr. of daylight on warm, clear days, but direct sunlight affected them adversely.

Penetration of Trichoderma lignorum into sapwood of Pinus taeda, M. SPRADLING (*Jour. Agr. Res. [U. S.], 52 (1936), No. 7, pp. 541–546, figs. 3*).—*T. lignorum* penetrated the fresh sapwood of *P. taeda* both radially and longitudinally, passing through the natural openings of the ray parenchyma cells, ray tracheids, wood tracheids, and resin ducts. It penetrated steamed wood four times faster than unsteamed wood, but the difference in rate did not appear to be due to differences in moisture content, since there was no apparent difference in growth rate in wood steamed for 30 min. at 100° or at 121° C.

Contributions to the pine tree honeycomb rot problem [trans. title], J. LIESE (*Forstarchiv, 12 (1936), No. 3, pp. 37–48, figs. 7*).—This general paper

on *Trametes pini* takes up the distribution of the disease, infections in the branches and trunks, the destructive effects on the wood, the rate of growth of the fungus, and control methods.

Three blue-staining fungi, including two new species, associated with bark beetles, C. T. RUMBOLD (*Jour. Agr. Res. [U. S.], 52 (1936), No. 6, pp. 419–437, figs. 10*).—*Ceratostomella ips*, which causes the blue stain of sapwood of *Ips* infested conifers on the Atlantic coast and of pine trees in western Japan, was also found associated with the bark beetles *I. emarginatus*, *I integer*, and *I. oregoni*, infesting conifers on the Pacific coast. Technical descriptions are given of *C. pseudotsugae* n. sp. associated with *Dendroctonus pseudotsugae*, which infests Douglas fir and larch on the Pacific coast, and *C. piceaperda* n. sp. associated with *D. piceaperda*, which infests spruce in eastern Canada.

Soil nematodes in forest nurseries, S. A. WILDE (*Phytopathology, 26 (1936), No. 2, pp. 198, 199, fig. 1*).—Several observations suggested that nematodes related to the genus *Rhabditis* participate either directly or indirectly in the destruction of coniferous seedlings during their early period of growth.

The development of root-knot nematode galls, J. R. CHRISTIE (*Phytopathology, 26 (1936), No. 1, pp. 1–22, figs. 8*).—The galls studied were produced by infesting the radicles of tomato seedlings with *Heterodera marioni*. Their age, known to within the limits of 24 hr., varied from 24 hr. to 40 days. The larvae tended to pass between the cells, and root injury through cell destruction was slight. When permanently located, the larval head usually was in the plerome near the beginning of the elongating region.

During the first 48 to 60 hr. the cells of the central cylinder near the parasite's head remained undifferentiated. After about 3 days these cells enlarged slightly, their nuclei swelled, and their walls disintegrated. The protoplasmic contents of adjacent cells coalesced to form a giant cell, and frequently these were members of rows which normally would have contributed to form the vessels. The giant cell invaded adjacent areas, and other cells were absorbed after dissolution of cell walls. Eventually nuclear membranes broke down, and giant-cell nuclei coalesced and finally disintegrated.

Division of the pericycle, stimulated by the parasite, resulted in a layer of small-celled parenchyma, outgrowths of which formed the frequently occurring lateral roots. Eventually some of the innermost of these small parenchymatous cells became differentiated into xylem elements of irregular shape.

Probably these morphological developments in the root are induced by the stimulative action of some secretion expelled through the mouth of the nematode

ECONOMIC ZOOLOGY—ENTOMOLOGY

Influence of the sun on wildlife cycles, L. W. WING (*Wisconsin Sta Bul. 435 (1936), pp. 29, 30*).—Brief reference is made to a study of the influence of the sun on wildlife population cycles.

Amendment of regulations 4, 18, and 19 of the regulations respecting game animals, land fur-bearing animals, game birds, nongame birds, and nests and eggs of birds in Alaska (*U. S. Dept. Agr., Bur. Biol. Survey, Alaska Game Comn. Circ. 12, Sup. 1 (1936), pp. 3*).—Amendments to the regulations previously adopted and published (E. S. R., 73, p. 638) are promulgated in this supplement.

Red squill investigations: Properties, toxicity, and palatability of red squill and powder baits to rats, M. G. O'CONNOR, R. E. BUCK, and C. R. FELLERS (*Indus. and Engin. Chem., 27 (1935), No. 11, pp. 1377–1380, figs. 2*).—This contribution from the Massachusetts Experiment Station on red squill

powder prepared from the bulb *Urginea maritima*, the nature of the rat-killing principle of which is unknown, describes a simplified method of biological assay by use of white rats. The lethal dose is selected as the smallest amount of red squill powder, in milligrams per kilogram of body weight, that kills at least 80 percent of the rats within 3 days. Rats vary considerably in their resistance to red squill, and the results of toxicity determinations will vary somewhat on repeat tests. A considerable number of red squill preparations were assayed. Red squill powder which had been in storage for 3 yr. showed no deterioration. There was considerable variation in toxicity among the preparations examined. Attention is called to the large relative variability in reaction of groups of rats at different feeding levels. The details of the work reported, presented in five tables, included a typical red squill toxicity assay, effect of size of rat on toxicity of red squill powder, toxicity of 12 commercial red squill preparations, bait acceptance in field trials as summarized by E. M. Mills from more than 12,000 returns to questionnaires sent to users of red squill baits from 1930 to 1933, inclusive, and a summary of cooperative rat eradication campaigns from the spring of 1930 to the fall of 1933.

With a view to determining the palatability of baits, approximately 400 feeding tests were conducted, the foods accepted in order of preference being raw meat, raw fish, rolled oats, whole wheat, corn meal, bread crumbs, canned fish, canned meat, cooked cereals, cheese, meat scraps, powdered milk, fish meal, fresh vegetables, cooked vegetables, and fresh fruit. "Numerous simple and complex food mixtures showed little improvement in acceptance over simple foods, though meat or fish and cereal mixtures were always readily eaten. The use in foods of oils of caraway, anise, catnip, cinnamon, and peppermint did not enhance palatability of the food to rats. Peppermint oil was repulsive to rats. In general, the rats preferred moist to dry baits (3 to 1 preference). However, if the baits contained added red squill powder, this preference became much less marked. In fact rats ate three times as much dry rolled oats containing added red squill as when the mixture had been moistened.

"The interesting observation was made repeatedly that rats which recovered from the effects of sublethal doses of red squill powder could rarely be induced to eat squill powder baits again, even after a lapse of several months. These same animals readily consumed baits containing alcohol or glycerol extracts of red squill. Similarly, extract baits were eaten repeatedly in sublethal doses . . . Extracts of red squill made with ethyl or methyl alcohol or glycerol were equally palatable to rats and in every case were much more readily eaten when mixed with food than when powder was used (3 to 1 preference)."

Working with canned rat baits, the toxicity of dry red squill powder was found to remain unchanged when heated to 240° F. in a retort for 90 min. When moistened with water or mixed with such carriers as meat, fish, or cereals, and sealed in tin cans or glass jars, no reduction in toxicity was noted. There was no evidence that the toxicity of the canned rat bait decreased significantly over a 2-yr. period of storage. It has the advantage of being easy to handle, transport, and use, as well as being always fresh, well-mixed, and of standardized toxicity.

Reference is made to the studies of Munch, Silver, and Horn (E. S. R., 62, p. 448).

Red squill investigations: Effectiveness of red squill extracts as raticides, R. E. Buck and C. R. Fellers (*Indus. and Engin. Chem., 27 (1935), No. 12, pp. 1497–1499, figs. 4; abs. in Massachusetts Sta. Bul. 327 (1936), p. 6*).—Reporting further upon work by the Massachusetts Experiment Station (see above) with red squill powder as a raticide, methyl and ethyl alcohols were found to be

the most efficient solvents tested for the extraction of the toxic principle. Extracts prepared with the Soxhlet extraction apparatus were more toxic than those prepared by shaking or stirring. Wheat bran proved to be a suitable and inexpensive carrier for the dried extract. Short extraction periods removed more toxic material from coarsely ground powder than from finely ground. The rats which did not receive a lethal dose of red squill preparation in the initial feeding repeatedly consumed more baits containing extracts, which was not the case with powder baits.

It is pointed out that toxic extracts can be prepared on a large scale by a percolation method. Field tests using baits containing extracts from red squill demonstrate their efficacy as raticides.

The buntings, finches, and their allies of New Jersey, L. A. HAUSMAN (*New Jersey Sta. Bul. 602 (1936), pp. 32, figs. 27*).—This contribution, the eighth (E. S. R., 73, p. 338) in a series of bulletins reporting studies of the birds native to New Jersey, deals with a group which includes the several buntings, finches, grosbeaks, and crossbills; the siskin; the redpoll; the junco; and the chewink. Brief descriptions are given of the adult males and females with notes on their life history and habits, importance, identification, and range within the State, together with a report upon their food habits, with a dietary presented in chart form for the forms appearing in the State.

[Contributions on entomological technic] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1936, ET–73, pp. 2, pls. 2; ET–74, pp. 2, pl. 1; ET–75, pp. 3, pls. 3; ET–76, pp. 2; ET–77, pp. 2, pl. 1; ET–78, p. 1, pl. 1*).—Further contributions in this series (E. S. R., 75, p. 75) include the following: Oviposition Cage for Obtaining Large Quantities of Codling Moth Eggs, by P. M. Eide; A Parasite Rearing Tray Developed to Meet Special Requirements, by W. F. Sellers; New Apparatus and Technique for Inflating Larvae, by G. H. Plumb, contributed from the Connecticut [New Haven] Experiment Station; A Rapid Method for the Estimation of Large Numbers of Full-Grown Larvae of the Raisin Moth [*Ephestia figulilella* Gregson], by H. C. Donohoe; A Thermally Insulated Unit for the Transportation of Adult Insect Parasites, by W. G. Bradley; and A Simple Hand Duster for the Application of Small Quantities of Dust, by T. E. Bronson.

An underground room for breeding parasites, L. W. NOBLE (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 286–288, fig. 1*).—Directions are given for the construction of a breeding room located below the ground level that has proved satisfactory in work at the parasite insectary at Presidio, Texas.

[Contributions on economic insects, insecticides, and insect control] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1936, E–368, pp. 69; E–369, pp. 5; E–370, pp. 3; E–371, pp. 4*).—Further contributions (E. S. R., 75, p. 77) presented are as follows: A Bibliography of Cyanide Compounds Used as Insecticides, 1931, by H. L. Cupples (E. S. R., 74, p. 227); Control of the Nantucket Pine Tip Moth [*Rhyacionia frustrana* Comst.] in the Central States, by R. C. Hall; The *Ips* Engraver Beetles, by R. A. St. George; and Suggestions for the Control of the Pea Weevil in Eastern Washington and Northern Idaho, by T. A. Brindley and F. G. Hinman (E. S. R., 73, p. 504).

[Notes on economic insects and insecticides] (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 461–469, figs. 3*).—The contributions here presented (E. S. R., 75, p. 224) are as follows: Lizard Aids in Range Insect Control, by G. F. Knowlton and C. F. Smith (p. 461), contributed from the Utah Experiment Station; A Novel Light Trap, by H. M. Tietz (p. 462); Fog Chamber: A Technique for Determining Spray Injury to Growing Plants Under Laboratory Conditions, by E. R. McGovran and M. D. Farrar (p. 463); Control of the Potato Leafhopper (*Empoasca fabae*) on Dahlia With Flour, Talc, and Infusorial Earth,

by E. I. McDaniel (p. 464); Injury to Carrots by the Potato Scab Gnat, *Pnyxia scabiei* (Hopkins), by F. G. Butcher (pp. 464, 465); Freezing Temperatures of the Chinch Bug (*Blissus leucopterus* Say), by E. Hixon and C. A. Sooter (pp. 465, 466); Lead Arsenate and Wetting Agents for Corn Earworm Control, by B. B. Fulton (p. 466), contributed from the North Carolina Experiment Station; Selenium in Dormant Sprays, by J. H. Lilly (pp. 466, 467); Thiuram Sulfides as Repellents to Leaf-feeding Insects, by H. G. Guy (p. 467), contributed from the Delaware Experiment Station; Remarkable Phenomenon of Reproduction in the Parasitic Hymenoptera [*Coccophagus* spp.], by S. E. Flanders (p. 468); Early Work With Fixed Nicotine, by C. O. Eddy (pp. 468, 469), contributed from the Louisiana Experiment Station; and European Sawfly *Pristiphora geniculata* Attacks Mountain Ash in the United States, by J. V. Schaffner, Jr. (p. 469).

[Work in economic entomology by the Massachusetts Station] (*Massachusetts Sta. Bul. 327 (1936), pp. 30–32, 39–54*).—Reporting (E. S. R., 73, p. 637) upon injurious and beneficial insects affecting the cranberry, H. J. Franklin takes up the progress of work with dust insecticides, airplane dusting, kerosene vapor and pyrethrum extract, and parasitism of the cranberry fruitworm by the egg parasite *Trichogramma pretiosa*. Brief reference is also made to studies of the blackheaded fireworm and the apple sphinx (*Sphinx gordius* Cram).

Investigation of materials which promise value in insect control, including oil sprays for dormant applications, spray materials for the control of gladiolus thrips, substitutes for lime-sulfur in summer sprays for orchards, control of white apple leafhopper with new pyrethrum and pyrethrum-nicotine sprays, control of striped cucumber beetle with derris and pyrethrum dusts, control of the squash vine borer, control of cabbage maggot with mercury compounds, and control of codling moth with nicotine sprays is reported upon by A. I. Bourne and W. D. Whitcomb. Control work with onion thrips, the spray residue problem, apple maggot control, introduction of parasites of oriental fruit moth in peach orchards, potato spraying experiments, and the value of electric traps against orchard insect pests are discussed by Bourne. Insects concerned in the dispersal of Dutch elm disease are reported upon by W. B. Becker; the apple leaf-curling midge (*Dasyneura mali* Kieffer), naphthalene as a fumigant for the control of greenhouse insect pests, plum curculio in apples, and the influence of temperature on development and control of red spider, by Whitcomb; and the adaptability of the ladybird beetle *Cryptolaemus montrouzieri* Muls. to the control of mealybugs in the greenhouse, by Whitcomb and W. Garland.

[Report of work in economic entomology by the New Hampshire Station] (*New Hampshire Sta. Bul. 289 (1936), pp. 19, 20*).—Brief reference is made to the progress of work on contact insecticides (E. S. R., 74, p. 231), by W. C. O'Kane, J. G. Conklin, L. C. Glover, and W. A. Westgate; and ovicides, by O'Kane and Glover.

[Report of work in entomology by the North Dakota Station], J. A. MUNRO (*North Dakota Sta. Bul. 286 (1935), pp. 63–68, fig. 1*).—The work of the 4-yr. period 1932–35 referred to (E. S. R., 67, p. 705) includes that with grasshoppers, bee management, wintering of bees, practical control of borers (the carpenter worm and the ash borer) in shade and shelterbelt trees, practical control of the field cricket, and a study of the Bertha armyworm.

[Report of work in economic entomology by the Wisconsin Station] (*Wisconsin Sta. Bul. 435 (1936), pp. 116–127, figs. 4*).—Reporting upon the work of the year (E. S. R., 74, p. 513), reference is made to a study of methods

of controlling the apple curculio, by P. O. Ritcher and C. L. Fluke; the continued efficiency of the new method of removing spray residues, by Fluke, E. P. Dunn, Ritcher, and J. H. Lilly (E. S. R., 74, p. 515); further tests in controlling the cherry casebearer, by Lilly; a search for a more effective insecticide for spraying oak trees to destroy June beetles, by Fluke; studies of white grubs, in cooperation with the U. S. Department of Agriculture, by T. R. Chamberlain, Ritcher, and Fluke; the use of Wisconsin grasshopper bait without danger to chickens or to persons eating chickens or eggs, by H. F. Wilson and C. E. Holmes; anatomical studies that revealed differences between dysenteric and healthy bees, by E. C. Alfonsus; the increased yields of canning peas resulting from sprays and dusts for control of aphids, by J. E. Dudley and T. E. Bronson; control of the potato leafhopper by petroleum oil and pyrethrum spray, by T. C. Allen; and further studies on the squash vine borer, by Allen.

Notes on little-known cotton insects, J. W. FOLSOM (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 282–285*).—Observations on a number of species of insects that frequent the cotton plant and whose biological relations to the plant have been little known, or unknown, including 13 species of Coleoptera and 11 of Lepidoptera, are reported.

The cherry aphid and cherry maggot of the Flathead Valley, R. D. EICHMANN (*Montana Sta. Bul. 313 (1936), pp. 11, figs. 4*).—This contribution gives a brief description of the black cherry aphid, its life history and habits, and means of control (pp. 2–6). A similar account is given of the black cherry fruitfly (pp. 7–10). It was found that the aphid could be effectively controlled by a single application each season of a spray consisting of summer spray oil 2.5 gal., water 97.5 gal., and 0.75 pt. of Black Leaf 40. Applications should be made in the spring under high pressure after the buds have swollen and show green on the tip and just as they begin to open. The injury by the cherry maggot can be reduced to less than 1 percent by the application of lead arsenate 0.5 lb. in 10 gal. of water at the rate of 1 qt. per tree, using low pressure to obtain fine drops, as soon as the flies appear in the orchard and repeated every 7 to 10 days if they continue to appear.

Insect and mite pests of the peach in Colorado, G. M. LIST and J. H. NEWTON (*Colorado Sta. Bul. 427 (1936), pp. 30, figs. 16*).—Practical accounts are given of the more important insect and mite enemies of the peach in Colorado and means for their control.

Toxicity of some nitro-phenols as stomach poisons for several species of insects, J. F. KAGY (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 397–405*).—This contribution includes the results obtained with a group of nitrophenols, of which 2,4-dinitro-6-cyclohexylphenol and some of its salts have shown considerable promise as stomach poisons for insects. Two,4-dinitro-6-cyclohexylphenol and the calcium, magnesium, lead, and copper salts were found to be several times more toxic than acid lead arsenate to the corn earworm. Calcium 2,4-dinitro-6-cyclohexylphenate, which was the most toxic salt examined, was about 4.4 times more toxic than acid lead arsenate to the corn earworm, 17 times more toxic than acid arsenate to the armyworm, and significantly more toxic than acid lead arsenate to the imported cabbage worm. The speed of toxic action for 2,4-dinitro-6-cyclohexylphenol and the four salts was several times greater than for acid lead arsenate. The mean survival times ranged from 2 to 5 hr.

Arsenic trioxide, 2,4-dinitro-6-cyclohexylphenol, and the calcium salt were fed quantitatively in baits to the red-legged grasshopper. The calcium salt displayed rather low toxicity, but the phenol was 2.5 times more toxic than arsenic trioxide. Furthermore, the speed of toxic action was approximately

twice that of the arsenical. The chemicals related structurally to 2,4-dinitro-6-cyclohexylphenol had little toxicity as stomach poisons. The indications were that deviations from the structure of the lethal phenol resulted in partial or complete loss of the high toxicity to insects. The consistent and promising results obtained with 2,4-dinitro-6-cyclohexylphenol and the four salts appear to recommend them for practical consideration as stomach poisons for mandibulate insects.

Homologs of paris green.—II, Higher members of the acetic acid series, F. E. DEARBORN (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 445–449*).—A further study of the subject (E. S. R., 73, p. 811) has led to the conclusion (1) that lauric, palmitic, stearic, and probably melissic acids form definite complex compounds with arsenic and copper; (2) that the ratio of arsenic to copper in the compounds is the same as for those formed by the lower homologs, namely, 3 mols of copper meta-arsenite united with 1 mol of copper salt of the fatty acid, from which the inference may be drawn that all the acids of the acetic series form compounds with the general formula $3CuAs_2O_4 \cdot Cu\ (acid)_2$; and (3) no conclusions as to toxicity are possible due to the meager data collected and to the poor physical condition of the test samples.

Results with home-made oil emulsions for orchard spraying, J. M. GINSBURG (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 361–364*).—A comparative study of commercial oil emulsions and home-made oil emulsions in the spraying of apple orchards made by the New Jersey Experiment Stations is reported upon. Highly refined oils were employed for summer spraying and an unrefined light lubricating oil for dormant spraying. The emulsions were prepared in ordinary orchard power sprayers equipped with mixers and high-pressure pumps.

"The results show that both types of oil emulsion produced equally efficient control on eggs of red mite and aphis when applied as delayed dormant sprays in combination with cresylic acid. The home-made summer oil emulsions compared well with the commercial products as far as both the control of codling moth and foliage injury are concerned. Several formulas for preparing home-made oil emulsions are suggested."

Tank-mixture method of using oil sprays for deciduous fruits, A. D. BORDEN (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 438, 439*).—The advantages of the tank-mixture method of using oil sprays in northern California, the use of which in southern California has been reported upon by Smith (E. S. R., 67, p. 563), are considered.

Soap washes and oil emulsions as summer sprays for peach, S. W. FROST (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 364–369*).—While considerable injury occurred where oil emulsions were applied by the Pennsylvania Experiment Station to peach foliage, this was not more serious than the injury in parts of the orchard where no oils were used. The combination of sulfur with oil emulsions did not increase the amount of injury except in the self-boiled sulfur blocks where defoliation was due to excessive sulfur. One and one-half and 2 percent oil emulsions, as well as vegetable and animal-oil-potash soaps, gave high toxicity against European red mite and terrapin scale.

Oil effects on shade trees, E. P. FELT and S. W. BROMLEY (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 357–360*).—Observations of the effects of summer oils on the foliage of shade trees, made in 1935 during the course of an investigation of the properties of summer oils, are reported upon.

Mechanism of absorption of pyrethrum powder by roaches, G. L. HOCKENYOS (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 433–437*).—It was found that when pyrethrum powder was applied to roaches there is a period of induction

before any reaction is evinced. "This period approximates 1.5 min. and does not vary for any concentration of powder that is strong enough to induce the reaction. This first reaction is one of great excitement and is followed by a stage of partial paralysis and then helpless paralysis. The time elapsing before the incidence of these last two reactions is influenced inversely by the concentration of pyrethrum in the dust being used.

"There is evidence that a dust containing 25 percent pyrethrum powder is more effective than one containing 50 percent pyrethrum or one containing less than 25 percent, but less effective than one containing 100 percent. A roach dusted with pyrethrum powder is probably most affected by the absorption of the toxic principles directly through the body integument, and very little by either penetration of the spiracles or ingestion through the mouth parts."

Notes on the warrior grasshopper Camnula pellucida (Scudder) and its egg parasite Aphoebantus hirsutus Coquillett in northern California, 1928–29, C. C. WILSON (*Jour. Econ Ent., 29 (1936), No. 2, pp. 413–416*).—The so-called warrior grasshopper (*C. pellucida*), officially known as the clear-winged grasshopper, occurs in injurious numbers in California only in the transition and humid-transition life zones.

"Definite oviposition beds are adopted, and the grasshoppers go from these to green vegetation to feed and back again to the original locations for oviposition. Moist peat and sandy loam soils are apparently preferred for oviposition grounds, though this preference is not very marked. Oviposition beds once established on any type of soil, however, become permanent. Eggs hatch over a period of approximately 2 mo., and the young grasshoppers remain in the area of the egg bed until the third instar. *Aphoebantus hirsutus* attacked from 0.7 to 62.4 percent of the grasshopper egg capsules in the various egg beds in the Tule Lake district in 1928 and was an important control factor, especially in the cases of egg beds on peat or sandy loam soils."

The Orthoptera of North Dakota, M. HEBARD (*North Dakota Sta. Bul. 284 (1936), pp. 69, fig. 1*).—This contribution is said to be the seventh report on the Orthoptera of the States and Canadian Provinces, which in part include the Great Plains, the first of which on the Orthoptera of South Dakota, corrections to which appear on pages 59–66, was published in 1925 and followed by the Orthoptera of Montana in 1928, of Colorado in 1929, of Alberta in 1930, of Kansas in 1931 (E. S. R., 67, p. 429), and of Minnesota in 1932 (E. S. R., 68, p. 782). Following a general discussion, accompanied by a map indicating the localities from which Orthoptera have been secured, a key is given to the species and races found in the State, followed by notes of these forms systematically arranged. Sixty-nine references to the literature appear as footnotes, and an index to the genera and species is included.

Further studies of onion varieties and onion thrips, F. B. MAUGHAN and G. F. MACLEOD (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 335–339*).—In reporting further (E. S. R., 69, p. 71), the four years of field experiments are said to have shown Sweet Spanish onion plants to be infested with significantly fewer onion thrips than any of the other varieties tested. It appears that no single factor can be established as the sole reason for the differences in numbers of thrips found.

Avoidance on the part of the thrips, angle of contact of the plant leaves, stage of growth of the plants, and recovery of the plant tissues from injury all have some bearing on the problem, but there are probably other influences also involved. In most instances it is likely that no single term will adequately define all the characteristics of a plant variety which influence its

susceptibility to insect attack and injury. It is pointed out that some thrips have always been found on the Sweet Spanish variety of onions, and that under conditions of forced feeding they can and do develop normally on this variety.

Cold storage as a control for gladiolus thrips, R. H. NELSON (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 389–393*).—The results of two seasons' experiments have shown that all stages of the gladiolus thrips can be completely eliminated by storing the infested corms at a constant temperature of 36° F. for 2 mo. or 40° for 3 mo. Limited data indicate that the larvae, pupae, and adults are of about equal resistance to cold. On the basis of earlier work, the eggs are much less resistant than the later stages. This method of thrips control in storage shows promise of being commercially practical.

Lygus bugs in relation to occurrence of shriveled alfalfa seed, C. J. SORENSON (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 454–457*).—The results obtained during the cource of work at the Utah Experiment Station indicate that the feeding of *Lygus* bugs (*L. hesperus* Knight and *L. elisus* Van D.), even for a short period of time, increased the number of shriveled seeds. The increase was generally in direct proportion to the degree of bug infestation. There was also some indication that the total number of seeds may be reduced as a result of the feeding of these bugs. Furthermore, these results point to a likelihood of smaller yields and of poorer quality alfalfa seed, resulting, partially at least, from heavy infestations of *Lygus* bugs in seed fields. The fact that an appreciable amount of shriveled seed was produced on the stems within the check cages where they were protected from *Lygus* bugs is evidence that these bugs are not the exclusive cause of shriveled alfalfa seed, and that other environmental factors contribute to its production.

Experimental studies of the hairy chinch bug, K. E. MAXWELL and G. F. MACLEOD (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 339–343, figs. 2*).—Work on the biology and control of *Blissus hirtus* Montandon, which heavily infested lawns and golf courses on Long Island during the years 1932–35 and has now appeared on turf grass in other northeastern States from Maine to Ohio and Virginia, is reported upon. There are two broods of the insect annually on Long Island. Short cutting, frequent watering, and top dressing have apparently aided grass in withstanding injury by it. There are indications that different species of grass vary in their susceptibility to injury, but additional work is needed to confirm these differences. Tobacco and rotenone dusts, together with nicotine-soap sprays, seem to offer the most promising possibilities of control.

Control of the cotton flea hopper, F. L. THOMAS (*Texas Sta. Circ. 77 (1936), pp. 8, figs. 4*).—The application of finely ground conditioned sulfur as a dust is said to have given satisfactory control of the cotton flea hopper when properly applied with suitable dusting machinery. From two to five applications at weekly intervals of from 12 to 20 lb. per acre, depending on the size of the cotton, severity of the infestation, and lateness of the season, is said to be sufficient to assure control.

The grape leaf-hopper and its control, H. L. DOZIER (*Del. Univ., Agr. Ext. Circ. 26 (1929), pp. 7, figs. 8*).—This contribution from the Delaware Experiment Station gives a description of the grape leafhopper and reports upon its injury, hibernation, natural enemies, and control measures.

Grape leaf-hopper and grape-berry moth investigations, L. A. STEARNS, W. R. HADEN, and L. L. WILLIAMS (*Delaware Sta. Bul. 198 (1936), pp. 44, figs. 16*).—Following a brief introduction, part 1 of this contribution on the grape leafhopper (pp. 7–31) deals with its life history and habits, economic

importance, natural control, and the results of experimental spraying. Part 2 (pp. 32–40) reports the results of similar studies of the grape berry moth. The details are presented in 14 tables.

An account of the grape leafhopper and its control, by H. L. Dozier, contributed from the station, is noted above, and a report on the seasonal life history of the grape berry moth in the State, by Dozier, Williams, and H. G. Butler, has been noted (E. S. R., 67, p. 571). Brief accounts of the progress of the work with the two pests from year to year have been noted (E. S. R., 74, p. 66).

"By the first week in July the majority of the first-brood nymphs [of the grape leafhopper] are generally in the third nymphal instar, some may have matured to the fifth instar, and a few may have transformed to adults. A special spray, thoroughly applied at this time, has proved sufficiently effective to insure the foliage conditions required throughout the remainder of the season for satisfactory development of the crop. The results of experimental spraying indicate that 40 percent nicotine sulfate, preferably in combination with some wetting agent, and certain rotenone and pyrethrum sprays as well, when used at dilutions of 1:400 or 1:800, will provide adequate control of this insect. Aside from weather conditions, which have already been designated as largely responsible for variations in the prevalence of the grape leafhopper from year to year, the entomogenous fungus *Entomophthora sphaerosperma* is probably the most important single natural factor adversely affecting the population of this insect. . . .

"The preblossom, postblossom, and 10-day applications of the present spray program [for the grape berry moth], although based upon the development of the host plant, satisfy well the timing requirements for effective first-brood control. The first-brood eggs are deposited and hatch and the peak of larval activity for this brood occurs during the period in which protection is provided by these three sprays. These are combination sprays of bordeaux (6–12–100) and lead arsenate (4 lb.) with fish oil added at the rate of 1 pt. per 100 gal. of water. This program has proved highly effective for grape berry moth control. Experimental results emphasize the desirability of including fish oil in the spray solution as a wetting and adhesive agent for lead arsenate. It effects a decided increase in the toxicity of this insecticide.

"The critical period for second-brood control occurs during late July and early August. The peak of larval activity for this brood is, therefore, approximately 6 weeks prior to harvest. A series of sprays applied at that time, similar to the program designed for first-brood control, would probably result in serious residue complications. Furthermore, foliage growth and cluster development are then such as to limit somewhat effective application of sprays. The value of a supplemental application for second-brood control was definitely established, however.

"In experimental spraying to determine the comparative efficiency of lead arsenate and calcium arsenate for control of this insect, practically the same results were obtained with calcium arsenate when it was substituted for lead arsenate on a pound for pound basis throughout the season. The arsenical load on the berries was considerably less in the case of calcium arsenate, and no appreciable foliage injury resulted from the particular samples employed."

Injury to alfalfa and red clover by the potato leafhopper, F. W. Poos and H. W. Johnson (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 325–331, figs. 2*).—In work at the Arlington (Va.) Experiment Farm the reduction in yield in cages caused by the potato leafhopper to alfalfa ranged from 13.9 to 27 percent during the years 1929, 1931, 1932, and 1933. Experimental data are presented

to show that the amount of injury which it causes to alfalfa and red clover is directly proportional to the numbers attacking these plants. In experiments conducted with vegetatively propagated lines of red clover to test the choice for oviposition by the potato leafhopper, 74.6 percent of the total (2,052) nymphs hatched from the foreign, more glabrous, Italian lines, while 25.4 percent hatched from a native rough-hairy Ohio line selected for vigor.

A leafhopper pest of clover and alfalfa, H. H. JEWETT (*Kentucky Sta. Circ. 44 (1936), pp. 7, figs. 3*).—A practical account is given of the potato leafhopper as an enemy of clover and alfalfa, studies of which by the author have been noted (E. S. R., 71, p. 815; 73, p. 809).

The Virginia creeper leaf-hopper, J. H. PEPPER and H. B. MILLS (*Montana Sta. Bul. 314 (1936), pp. 4, fig. 1*).—A brief practical account is given of the grape leafhopper, its distribution, seasonal history, and control. This leafhopper is said to have been increasing in importance during the past 10 yr. as an enemy of the Virginia creeper in Montana. A spray consisting of 1⅔ oz. of Black Leaf 40, 8 oz. of summer oil emulsion, and 5 gal. of water is said to have given the highest degree of control.

Laboratory method of comparing the toxicity of substances to San Jose scale, J. F. KAGY (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 393–397*).—A description is given of a method that has given good results in comparing the toxicity of various substances to San Jose scale. This method, which affords a means by which homogeneous results can be obtained and accurate comparisons of materials made without danger of erroneous conclusions being formulated, it is thought can be extended for usage in toxicity studies with other scale insects.

Comparative toxicities of methyl thiocyanate and hydrocyanic acid to the California red scale, F. H. LATHROP, H. L. CUPPLES, J. HILEY, and H. R. YUST (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 410–412, figs. 2*).—The studies reported have demonstrated that the vapor of methyl thiocyanate as a fumigant is remarkably toxic to all stages of the California red scale. "Molecule for molecule, it is equally as toxic as hydrocyanic acid. In selecting a fumigant for the fumigation of trees, however, other important factors must be taken into consideration. The fumigant should preferably be readily volatile, although it might be found possible to overcome some deficiency in respect to volatility, and it is a fundamental requirement that a dosage sufficient to kill the scale shall not cause excessive injury to the tree. In each of these respects methyl thiocyanate is probably inferior to hydrocyanic acid. It is much more difficult to volatilize, and small-scale tests on young citrus trees indicated that it is too injurious to the trees for successful fumigation. The studies of the effects upon the plant tissues are not definitely conclusive, however."

Anomis erosa Hubn. as an insect pest of cotton, J. T. CREIGHTON (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 279–282*).—A report is made of observations of the abutilon moth as a leaf defoliator of cotton during a period of 3 yr. in Florida. Numerous plants of the Malvaceae were found to be attacked, those subject to quite extensive damage by the larvae including flowering maple, okra, cotton-rose, roselle, Chinese mallow, cotton, swamp or rose mallow, bell pepper, and *Urena lobata*, *Abutilon avicenna*, and *Malva rotundifolia*.

The moth is known to occur in 17 States and the District of Columbia, from Massachusetts to Florida and westward to New Mexico, Texas, Oklahoma, and Kansas. Of its several parasitic enemies *Syntomosphyrum esurus* Riley, a parasite of the pupa, is one of the most common and efficient. The egg parasite *Trichogramma pretiosa* Riley aids materially in its control. Two species of Diptera, *Megoselia scalaris* L. and *Publiciphora* spp. have been

found to attack it. Several species of Hemiptera have been found preying upon the larvae and pupae.

Status of the tomato pin worm Gnorimoschema lycopersicella Busck in Pennsylvania, C. A. THOMAS (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 313–317*).—In continuation of earlier observations by the Pennsylvania Experiment Station (E. S. R., 69, p. 80), the tomato pinworm has been found present in greenhouses from Oxford, Chester County, on the west, to Chester, Delaware County, on the east, and from the north of Unionville, Chester County, on the north, south into northern Delaware. In the Chester County area it has been found feeding on four species of solanaceous plants, including the tomato, eggplant, potato, and horse nettle. Notes are given on its biology, natural enemies, and control measures. The apparent difficulty experienced by the insect in passing the winter outdoors and the fact that it will not feed on the common greenhouse flowering plants have led to the recommendation that growers in the Pennsylvania area either omit the fall crop of tomatoes and substitute flower crops, or that they leave the greenhouses open to the weather for some time between the end of the fall crop and the beginning of the spring crop in February. These methods are said to have been very effective where they have been tried, the first mentioned being apparently the more effective.

Observations on the life history of Platynota stultana Wlsm. on greenhouse rose, R. H. NELSON (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 306–312*).—The tortricid leaf roller *P. stultana*, a native of Mexico and California, was found on roses in a greenhouse at Alexandria, Va., in September 1933, when about 15 percent of 100,000 rose plants in the greenhouse were infested. This is said to have been the first discovery of the moth as a pest of greenhouse roses in the eastern United States. The procedure and methods for the life-history studies of this insect are described. The studies were made at approximately 70° F. The habits and appearance of the various stages are discussed. The mated females readily oviposit on glass slides when confined in wire screen cages, and complete and accurate oviposition records were therefore possible. This moth is apparently not parthenogenic, since unmated females either died without ovipositing or laid abnormally shaped eggs which did not hatch. The average number of eggs deposited per fertilized female was 293.6. The largest number of eggs laid in one day by one moth was 188. Average lengths of the various stages are as follows: Incubation period 9 days, larval period 31.1 days, pupal period 9 days, and from egg to adult 48.6 days. As calculated by Dyar's rule there are five instars. Three species of hymenopterous parasites, *Meteorus dimidiatus* (Cress.), *Angitia ferrugincipes* (Ashm.), and *Cremastus* sp., were reared from *Platynota* larvae collected on greenhouse roses.

The corn ear worm in southeastern Georgia, G. W. BARBER (*Georgia Sta. Bul. 192 (1936), pp. 18, figs. 8*).—This contribution briefly refers to the importance of the corn earworm, its food plants, damage to corn, damage by other insects following earworm attack, its several stages, seasonal history, natural limiting factors including cannibalism of larvae and other enemies, and methods by which injury to corn may be limited.

Cold-water treatment as a control for the sugar cane borer, E. K. BYNUM and A. I. BALZER (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 458, 459*).—The results of experiments conducted independently at two locations, one at Houma, La., and the other at Beaumont, Tex., definitely show that the immersion of sugarcane for 72 hr. in water at ordinary temperatures gives only a partial kill of the sugarcane borer. This treatment cannot be recommended for treating

infested sugarcane destined for borer-free territory. The mortality is high enough to give partial control, and the treatment might be advisable as a plantation practice under some conditions.

The wax moth and its control, W. WHITCOMB, JR. (*U. S. Dept. Agr. Circ. 386 (1936), pp. 14, figs. 5*).—An account is given of the economic importance and sources of loss caused by the wax moth, its history and distribution, life history, other moths causing damage to stored combs, and natural and artificial control.

Effect of procedure on performance of certain insecticides recommended for codling moth control, H. G. GUY, P. L. RICE, and L. A. STEARNS (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 378–383, fig. 1*).—In control work with the codling moth at the Delaware Experiment Station lead arsenate was found to be decidedly the most effective insecticide of those tested in protecting the fruit from attack. Calcium arsenate, zinc arsenate, Kalo, and Manganar were effective in the order named. Spray drift did not affect the relative efficiency of these insecticides when tested by the single-tree plat procedure. Although the spray deposit on the foliage of single-tree plats was adulterated by spray drift, the fruit was largely protected by the foliage from such adulteration. Single-tree plats have the advantage of covering a small area and provide replicates, therefore, less subject to pronounced environmental differences. Single-tree plats should be enlarged, however, by one or two trees to overcome the possibility of a poor set of fruit, and should be replicated a sufficient number of times to offset such a condition.

Codling moth experiments in New Jersey in 1935, B. F. DRIGGERS (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 369–378*).—In further work at the New Jersey Experiment Stations (E. S. R., 73, p. 76), 10 different combinations of nicotine were tested in comparison with lead arsenate-lime and lead arsenate-summer oil on three varieties of apples in the two-brooded codling moth area at Glassboro. Relative codling moth control and the effect of the materials on fruit and foliage were determined. Three spreaders to be used with tank-mixture bentonite-nicotine were tested. Summer oil plus nicotine was compared with nicotine tannate in the last two or three sprays following bentonite-nicotine, both as regards codling moth control and effect on residue at harvest. The amount of nicotine deposited and retained on the foliage by the different nicotine combinations was studied.

Based on clean fruit produced at harvest, a proprietary compound of bentonite and nicotine carrying a zinc sticker (Black Leaf 155B) gave the best control of codling moth, being superior to lead arsenate-lime and lead arsenate-summer oil. It was superior to lead arsenate-lime in preventing wormy fruit, but not as effective as lead arsenate-summer oil. However, severe foliage injury appeared late in the season on two varieties sprayed with Black Leaf 155B. A loose, oily, dust coating characteristic of the B formula appeared to give control of codling moth superior to tank-mixed bentonite-nicotine carrying double or triple the amount of nicotine on foliage. Tank-mixed bentonite and nicotine compared favorably with lead arsenate-lime and lead arsenate-oil in the production of clean fruit at harvest. It was superior to either lead arsenate schedule in cutting down stings, but was inferior to lead arsenate-oil in preventing larval entry. The tank-mixed bentonite-nicotine had the additional advantage of producing no fruit or foliage injury. Nicotine sulfate and summer oil was found superior to nicotine tannate as a spray to follow bentonite-nicotine both for worm control and residue removal. Aresket and dried skim milk were found to be equal to sulfo-ammonium soap as a spreader for tank-mixed bentonite-nicotine. Lime added to bentonite sulfur-nicotine in the second-brood sprays

aided in the removal of the residue, but greatly reduced the amount of nicotine on the foliage between sprays.

Laboratory tests with impregnated oil as codling moth larvicides, E. R. McGovran (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 417–420*).—In a study of the toxicity of available chemical compounds about 100 materials were mixed with a refined petroleum oil and tested in the laboratory on newly hatched codling moth larvae. Of these, nicotine sulfate, methyl salicylate, copper cyanide, copper oleate, alpha naphthylamine, and iodine were the most toxic at concentrations of 2 percent or less in the oil.

Chloropid populations on pasture grasses in Kansas, D. A. Wilbur and C. W. Sabrosky (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 384–389, figs. 6*).—With the view to obtaining information on the insect population of grasslands, their numerical abundance and seasonal distribution, relationship to the grasses on which they are found, and their relationship to neighboring crops, regular and standardized semiweekly collections were inaugurated and carried on by the Kansas Experiment Station throughout the entire growing seasons of 1933 and 1934. In the course of the study approximately 11,300 chloropid flies, representing 14 genera and 53 species, were collected, examined, and identified. The results are presented in 5 charts.

Toxic action of formaldehyde on the adult house fly (Musca domestica L.), J. C. Elmore and C. H. Richardson (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 426–433, fig. 1*).—In work with the housefly the effect of formaldehyde was determined by feeding individual flies small drops of solutions which contained known concentrations of formaldehyde or paraformaldehyde. The amount of toxic liquid imbibed was ascertained immediately after feeding from the gain in weight of the fly. The population from which the test insects were taken comprised flies weighing from 7 to 24 mg, with a mean weight of 15.6±0.1 mg.

"Formaldehyde causes a progressive paralysis of the nervous system from posterior to anterior. The median lethal dose of paraformaldehyde calculated as HCHO is estimated as 2.24 mg per gram of body weight; for commercial formaldehyde it is estimated as 1.54 mg HCHO/g. The greater toxicity of unneutralized commercial formaldehyde solutions as compared with paraformaldehyde solutions probably results from the greater concentration of unpolymerized formaldehyde in the former solutions. The greater repellence of the commercial formaldehyde solutions may also contribute to their lower median lethal dose.

"Formic acid solution (pH 2.4) was less repellent to houseflies than a 3-percent solution of unneutralized commercial formaldehyde of pH 3.5. Paraformaldehyde solution (3-percent HCHO) adjusted to pH 3.5 with formic acid was also less repellent than unneutralized commercial formaldehyde solution. A solution of commercial formaldehyde, neutralized with potassium hydroxide, was similar in repellent properties to paraformaldehyde solution of equivalent HCHO concentration. The addition of alkali to commercial formaldehyde solution causes rapid polymerization as well as acid neutralization. The greater repellence of unneutralized commercial formaldehyde solution is probably the result of the greater concentration of unpolymerized HCHO in such solutions."

Dusts for control of flies on cattle, E. N. Cory, H. G. Harns, and W. H. Anderson (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 331–335*).—Outdoor work with flies on cattle in 1933 and 1934 has shown that the results of dusting and spraying experiments should be calculated on the basis of the average performance of a standard material in order that the effect of climatological variables may be evaluated. Impregnated dusts are generally superior to mixed

dusts in the same series. Stabilization does not significantly increase the value of the dusts. Pyrethrum-impregnated dusts provide more protection per unit cost than do the derris-impregnated dusts, but the derris-impregnated dusts are the more toxic per unit. Impregnated dusts gave better protection than the spray. Pine oils add little to the efficiency of the impregnated dusts. They increase the initial toxicity rating of the materials, but lower their efficiency over a 3.5-hr. period.

Observations on the West Indian fruit fly at Key West in 1932–33, L. C. McAlister (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 440–445*).—A report is made of investigations of the hosts and the reaction to poison sprays of two species of West Indian fruitfly, *Anastrepha acidusa* Walk. and *A. suspensa* Loew, on the island of Key West, conducted in 1932–33. The results of ovipositing experiments under cage conditions indicated that the species *A. acidusa* may successfully attack 35 different kinds of fruit, and that *A. suspensa* may also attack many of the same fruits. The results of insecticide tests confirmed the superior merits of tartar emetic as a fruitfly bait spray.

Observations on Anastrepha pallens (Coq.) reared from wild fruits in the lower Rio Grande Valley of Texas during the spring of 1932, M. McPhail and N. O. Berry (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 405–410, figs. 2*).—An investigation of the fruit fly *A.* (*Pseudodacus*) *pallens* undertaken in the spring of 1932 with a view to determining its possible economic importance in the lower Rio Grande Valley of Texas, where it was first collected in 1914, is reported upon. It has been found to breed in the small fruit of a bushy shrub, *Bumelia spiniflora*, found growing on uncultivated land. Vegetables and citrus appear to be free from its attack, even attempts to force oviposition in these crops having failed.

Certain insect vectors of Aplanobacter stewarti, F. W. Poos and C. Elliott (*Jour. Agr. Res. [U. S.], 52 (1936), No. 8, pp. 585–608, figs. 13*).—Hibernating adults of the corn flea beetle were found by the authors to harbor *A. stewarti*, the cause of bacterial wilt of corn, in a virulent condition in their bodies, it having been detected in 19 percent of the 175 beetles examined during April 1934. Young corn plants are inoculated with bacterial wilt in the spring by the feeding of these beetles, and this appears to be the chief source of early infection each year. The finding of earlier workers was confirmed in that bacterial wilt of corn is not transmitted through the soil. Direct transmission from infected to healthy corn plants was effected by means of the corn flea beetle, *Chaetocnema denticulata*, and the southern corn rootworm. Tests with 13 other species of insects yielded only negative results. A total of 7,338 insects, representing 40 species in 33 genera, collected on or near corn infected with bacterial wilt, during the corn-growing season in 1934, were tested for the presence of *A. stewarti*, and 8 species yielded this organism. A total of 3,977 isolations were made, 1,464 of which were suspected of containing *A. stewarti* and were tested by inoculation on corn, 953 yielding positive results. From six species, not including the *Chaetocnema* spp., *A. stewarti* was obtained in only a single instance and additional work is necessary to determine the importance of these species as vectors of this organism. Collections of adults of the corn flea beetle from 12 different host plants and from 29 different localities yielded *A. stewarti* in from 0 to 75 percent of the individuals in each collection.

Notes on biology and control of the Asiatic garden beetle, H. C. Hallock (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 348–356, fig. 1*).—This contribution on *Autoserica castanea* Arr. supplements work previously noted (E. S. R., 68, p. 791; 71, p. 353).

Value of lime and aluminum sulfate as a repellent spray for Japanese beetle, F. W. METZGER and J. W. LIPP (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 343–347, fig. 1*).—In control work with the Japanese beetle the application of 20 lb. of hydrated lime and 3 lb. of aluminum sulfate to 100 gal. of water protected the foliage of Yellow Transparent and Red Astrachan apples from the attack, three applications being necessary in an area very heavily infested by the beetle. Early-ripening fruit cannot be protected by this spray unless careful orchard sanitation is practiced and the crop ripens uniformly. Protection from beetle attack is afforded to peach foliage and fruit by the use of this combination, but after July 1 it cannot be applied with safety on early-ripening varieties because of the objectionable residue.

Beetle injury on asparagus brush is materially reduced by 3 applications of 20 lb. of hydrated lime, 6 lb. of aluminum sulfate, and 0.5 lb. of sodium lauryl sulfate to 100 gal. of water. The foliage of cultivated blueberries and rhubarb can be protected by 2 or 3 applications of lime and aluminum sulfate at the same concentration as that employed on peach and apple.

Value of improvements in Japanese beetle traps and bait as measured by the numbers of beetles caught, F. W. METZGER (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 449–454, fig. 1*).—It is pointed out that work conducted over a period of 10 yr. with Japanese beetle traps has resulted in a considerable improvement of such devices with respect to attracting beetles and to capturing insects thus attracted. The data indicate that, in an equal infestation, the 1934 trap is probably capable of capturing 55 times as many beetles as the device used in 1925. In lightly infested areas, traps capture a higher percentage of the beetles which are attracted than in regions where the beetle is present in great abundance. Improvements in bait have not resulted in a trap which will attract all the beetles in the immediate vicinity, nor have the improvements in the trap resulted in one that will capture all the beetles which are attracted.

The effectiveness of various arsenicals in destroying larvae of the Japanese beetle in Sassafras sandy loam, W. E. FLEMING and F. E. BAKER (*Jour. Agr. Res. [U. S.], 52 (1936), No. 7, pp. 493–503, fig. 1*).—In continuation of studies of insecticide control of the Japanese beetle larvae (E. S. R., 71, p. 227; 72, pp. 80, 81, 230; 74, p. 237), the relative effectiveness of the inorganic arsenates and arsenic trioxide as stomach poison insecticides for destruction of the larvae of the Japanese beetle in the soil was determined under controlled conditions immediately after application and at intervals up to 60 mo., more than 18,000 tests being made.

The period of time in the soil was the most important factor associated with the effectiveness of the arsenates, but other factors were more important in modifying the insecticidal action of arsenic trioxide. Acid lead arsenate appeared to be the most dependable arsenical for killing larvae; zinc arsenate and ferric arsenate were almost as consistent. Basic lead arsenate was of no value. Magnesium arsenate and dicalcium arsenate decreased in effectiveness more rapidly than acid lead arsenate, but no significant difference in the rate of change was noted with the other materials. The decrease in effectiveness in the field is attributed to the slow conversion of the arsenic into a form, possibly a complex basic salt, that is not toxic to the insect, as well as to loss by leaching.

Notes on life history, habits, and distribution of Heteroderes laurentii Guér., K. L. COCKERHAM and O. T. DEEN (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 288–296, figs. 11*).—Observations on the Gulf wireworm, first recognized as an economic pest in the United States in Baldwin County, Ala., in 1927, have shown the species to complete its life cycle in a single year. The contribution

reports upon its present known distribution, seasonal peaks of egg deposition and pupation, the crops attacked, and habits of larvae and adults. Notes on flight, hibernation, field populations, and natural enemies are included.

The flour beetles of the genus Tribolium, N. E. Good (*U. S. Dept. Agr., Tech. Bul. 498 (1936), pp. 58, figs. 22*).—The first part of this contribution consists of a partial revision of the genus *Tribolium*, represented by seven species, namely, *T. castaneum* Herbst, *T. confusum* J. du Val (officially known as the confused flour beetle), *T. madens* Charp., *T. destructor* Uyttenb., *T. gebieni* Uyttenb., *T. indicum* Blair, and *T.* (*Leanum*) *myrmecophilum* Lea. A key is given for their identification together with synonymies and descriptions of the first four, or economically important, species as well as of the genus.

The confused flour beetle and *T. castaneum* are by far the most abundant and destructive beetles infesting flours and other prepared cereal products. A large part of the bulletin is devoted to the life history of *T. castaneum*, shown to be the correct name of *T. ferrugineum* Fab., officially known as the rust-red flour beetle. The duration of the different stages and of the different larval instars at room conditions, 25°, 27°, and 30° C., are given for *T. castaneum* and for the confused flour beetle. The incubation period of the eggs at 27° averaged 5.2 days for *T. castaneum* and 6.8 for the confused flour beetle. The number of larval instars ranges from 5 to 11 and the larval period from 22 to over 100 days, depending on environmental conditions and individual variation. Larval head capsule widths are given. The average pupal periods at 27° were 7.1 days for *T. castaneum* and 7.9 days for the confused flour beetle. Adults lived as long as 3 yr. 271 days. The longest oviposition periods recorded were 432 days for the confused flour beetle and 308 days for *T. castaneum*. The greatest number of viable eggs laid by a single female was 976 for the confused flour beetle and 956 for *T. castaneum*.

A disease caused by a coccidian, *Adelina* sp., kills large numbers of *Tribolium*. The mite *Acarophenax tribolii* New. and Duv. is the most common parasite, while the straw itch mite and the bethylids *Rhabdepyris zeae* Turner and Waterston and *Sclerodermus immigrans* Brid. are also recorded as parasites. The hemipteran *Xylocoris cursitans* Fall. and adults of the cadelle are recorded as predators. Control methods include fumigation with hydrocyanic acid gas or chloropicrin, and the use of heat.

A list of 108 references to the literature is included.

Preliminary report of trap-log studies on elm bark beetles, C. H. Martin (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 297–306, fig. 1*).—In studies of the dark native elm bark beetle *Hylurgopinus rufipes* Eichoff and the European elm bark beetle *Scolytus multistriatus* Marsham, the largest number of the former were found to come to early spring-cut logs while the largest number of the latter came to early August-cut logs.

"For both species of beetles there was a correlation between a low degree of infestation and noninfested logs. Logs in deep shade attracted the most *Hylurgopinus* while those in brighter locations attracted the most *Scolytus;* logs in too bright a location were not as attractive to *Scolytus* as those that were semishaded. In the experiment reported, vertical logs attracted only half as many *Scolytus* as the horizontal. Individual logs apparently remained attractive to *Hylurgopinus* and *Scolytus* for a longer period than a whole cutting. Under the proper conditions isolated logs seemed to be about as attractive to *Hylurgopinus* as groups of racked logs. Logs in clearings under lath shelters were not attractive to either *Hylurgopinus* or *Scolytus*. Suspended logs attracted many *Magdalis*. Paraffin logs did not increase beetle infestation. There did not seem to be any correlation between the moisture content of the

phloem of logs and *Hylurgopinus* and *Scolytus* infestations. No girdled trees were infested. A difference of 3.5 to 8.5 in. in the diameter of a log did not influence either *Hylurgopinus* or *Scolytus* infestation."

Strawberry root-weevil control in Oregon, D. C. MOTE (*Oregon Sta. Circ. 115 (1936), pp. 12, figs. 10*).—This is a practical account of the activity of the strawberry root weevils and means of their control, based upon the investigations of Wilcox et al., previously noted (E. S. R., 75, p. 232).

Further developments concerning wax production by the honeybee colony.—I, A study of the production of wax scales and comb building, C. M. GWIN (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 318–321, figs. 3*).—In an experiment conducted, colonies of bees fed either honey or sugar sirup produced wax without being fed pollen. When fed sugar sirup and water in a temperature-controlled compartment, a colony of bees was kept producing wax for a period of 6 mo. When used for wax production, bees persisted longer when fed sugar sirup than when fed honey, other factors remaining constant. It was possible to rear young bees under these controlled conditions provided they were supplied sufficient pollen, honey or sirup, and water.

Spray and dust poisoning of honeybees in New Jersey, R. S. FILMER (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 322–324*).—Observations by the New Jersey Experiment Stations have shown the increase in arsenical poisoning of honeybees in that State during recent years to be due to (1) increased use of arsenical dusts to combat insect pests, (2) the use of sweetclover as a permanent cover crop in orchards where heavy spraying for codling moth or where special Japanese beetle sprays are applied, (3) an unusual apple scab situation during the blooming period, which resulted in the early application of the petal-fall spray, and (4) unusually dry weather during the summer of 1935, which resulted in the failure of the clover crop and which provided ideal conditions for the retention of the dust on the plants for prolonged periods.

Effectiveness of sodium fluoride, arsenic trioxide, and thiodiphenylamine as food poisons for the firebrat, Thermobia domestica (Packard), B. T. SNIPES, R. E. HUTCHINS, and J. A. ADAMS (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 421–426, fig. 1*).—In control work "firebrats reared and kept at 34.5° C. and about 70 percent relative humidity were confined singly with access to their preferred food mixed with various concentrations of three poisons. Care was taken that the insects were not compelled to remain in contact with the bait. In addition to the controls, none of which died, 100 individuals were tested with each concentration for periods of 1 week. With thiodiphenylamine, at concentrations up to 20 percent, only a few insects died in 1 week. With arsenic trioxide, 4, 12, and 20 percent, about two-thirds of the insects died. With sodium fluoride, 4, 8, and 12 percent, about nine-tenths of the insects died. Preliminary tests indicated that both contact effects and repellence by poisons are significant in the effectiveness of these mixtures. A bait is recommended in which 7 percent of the weight is sodium fluoride."

Mass liberation of an oriental fruit moth parasite, D. M. DANIEL (*Jour. Econ. Ent., 29 (1936), No. 2, pp. 459–461, fig. 1.*).—The results of liberations of the parasite *Macrocentrus ancylivorus* Roh. by the New York State Experiment Station in a solid block of some nine thousand 10- to 20-year-old peach trees largely of the Elberta variety, growing on 72 acres during the years 1932 and 1933, are reported. The infestation of this orchard by the oriental fruit moth had increased to a point where about half the fruit was injured in 1932. On July 14 of that year a colony of 200 female parasites was liberated in the orchard, and at the harvest period 48.34 percent of the 5,625,000 fruits was found infested by the oriental fruit moth. The following year, 1933, 12,000

female parasites were liberated during the 2-mo. period, June 30 to August 31, and at harvest time 15.96 percent of the estimated 4,680,000 fruits produced was found infested. This was a reduction of 72 percent. It is pointed out that three nearby orchards which received liberations in 1932 only, showed infestations practically the same in 1933 as in 1932. The experiment is said to have come to an abrupt end following the subzero weather of the winter of 1933–34, when practically all the trees in the block were killed outright or severely injured. It cannot now be repeated since practically every peach orchard in the State at the present time contains this parasite either through liberation or spread from colonized areas, and the fruit moth population has fallen too low for mass liberations to be of benefit.

Chrysis shanghaiensis Smith, a parasite of the oriental moth, D. E. PARKER (*Jour. Agr. Res. [U. S.], 52 (1936), No. 6, pp. 449–458, figs. 5*).—The results of 2 years' study of the life history and habits of *C. shanghaiensis*, introduced from Japan to attack the oriental moth, are reported upon. The adult female, which is very active and capable of strong flight, attacks the larvae of the moth by chewing a hole in the cocoon, depositing an egg in it external to the larvae, and then sealing the hole. The egg of this parasite hatches in about 4 days, the larvae complete the first stadium in an average of 4 days, and the second, third, and fourth stadia in an average of 3 days each. The last-instar larva encloses itself in a golden silken cocoon, where it remains throughout the winter. The larva pupates during the latter part of June, and the adults emerge late in July and in the first part of August. Uncompleted experiments on the interrelations of *C. shanghaiensis* and *Chaetexorista javana* indicated that some competition existed when both species attacked the same host larva.

The low temperatures of the winter of 1933–34 proved too severe for the *Chrysis* larvae held at the laboratory, and it was considered that such low temperatures would limit the survival of the parasite in the vicinity of Boston where the oriental fruit moth is established.

A list is given of 15 references to the literature.

The cyclamen mite (Tarsonemus pallidus) and its control on field strawberries, L. M. SMITH and E. V. GOLDSMITH (*Hilgardia [California Sta.], 10 (1936), No. 3, pp. 53–94, figs. 8*).—The cyclamen mite (incorrectly known as the strawberry mite, *T. fragariae* Zimm.), which first appeared on strawberries in 1892 and has been reported in 10 European countries and 27 States in this country, has become the most important economically of the animal pests attacking field and greenhouse strawberries in California. It causes severe injury to the Nick Ohmer strawberries in central California, in which area the Marshall variety is resistant. The Klondike variety is not seriously affected in southern California.

"The majority of adult mites are females, which lay two or three eggs a day. The immature stages are completed in about 13 days, hence a very rapid increase in population is possible. The mites live in the folded leaves in the center of the crown of the plant. Their feeding punctures cause severe distortion and dwarfing of the leaves. Only adult females survive the winter. They hibernate in the crowns between the bases of the petioles. They emerge from hibernation about the latter part of February.

"No satisfactory method of controlling the mites on established plants has been found. However, they can be eradicated from planting stock and the field subsequently kept free from mites. A complete kill of mites on planting stock can be obtained by immersing the plants in water at 110° F. for 30 min. or by treating the plants with saturated air at 110° for 1 hr. Of these

two methods, the vapor treatment is superior to the immersion method. For treatment, plants must be removed from shipping boxes and loosened if tied in bundles. They should be placed loosely in screen or slat trays or boxes and stacked to allow a maximum of penetration of either the hot water or vapor. After treatment the plants should be cooled and dried before repacking. Precautions should be taken to prevent excessive drying. If plants are repacked while wet saprophytic fungi may kill a large percentage of them. Varieties show varying sensitivity to heat treatments. Klondike and Nick Ohmer are relatively resistant, while Dorsett is more easily injured. In either method the temperature must be accurately held at 110° and should not vary more than 1°. The heating medium (water or vapor) must be thoroughly agitated to insure uniform exposure of all plants to the desired temperature. Planting should follow treating as soon as possible. Plants should be set in clean soil as far from old infested fields as possible, preferably 500 yd. or more."

A list is given of 26 references to the literature.

ANIMAL PRODUCTION

The American Society of Animal Production: Record of proceedings of the twenty-eighth annual meeting, November 29 and 30, 1935 (*Amer. Soc. Anim. Prod. Proc., 1935, pp. 317, figs. 8*).—This is the report of the annual meeting held at Chicago, November 29 and 30, 1935 (E. S. R., 73, p. 824). The following papers were presented in the dairy cattle, beef cattle, swine, horse, sheep and lambs, nutrition, and meats sections:

Animal Husbandry's Responsibility in Land Use Planning, by H. H. Kildee (pp. 9–16); The Relation of Population Trends to Commercial Agriculture, Especially to Production of Animal Products, by O. E. Baker (pp. 16–30); Changes Which Will Come in Animal Husbandry of the Western States if Planned Utilization of Land Becomes a Reality, by J. A. Hill (pp. 30–37); Changes in Corn Belt Husbandry and Types of Problems Involved, by W. C. Coffey (pp. 38–43); Prospective Changes in Animal Husbandry in the Eastern States, by H. L. Garrigus (pp. 43, 44); Adjustments Which a Land Utilization Program May Bring in Dairy Production, by E. L. Anthony (pp. 45–49); Correction Factors and Germ Plasm in Dairy Cattle Breeding, by W. L. Gaines (pp. 50–53); Variations in Mammary-gland Development in Dairy Calves, by W. W. Swett and C. A. Matthews (pp. 54–59); Some Influences That May Change the Lactose Content of Milk, by W. E. Petersen (pp. 59–63); Shrimp Meal for Milk Production, by R. H. Lush (pp. 63–66); Length of Service Period in Relation to Productive and Reproductive Efficiency in Dairy Cows, by A. B. Chapman and L. E. Casida (pp. 66–70); Adjustments Which a Land Utilization Program May Bring in Beef Production, by R. Beresford (pp. 71–75); The Consumption of Reed Canary and Brome Grasses by Grazing Steers, by W. P. Garrigus and H. P. Rusk (pp. 75–82); Creep Feeding Range Calves.—Final Report, by E. B. Powell (pp. 83, 84); Florida Range Cattle Problems, by A. L. Shealy (pp. 85–88); The Corn Plant for Wintering Stock Calves, by R. R. Thalman and H. J. Gramlich (pp. 89–93); Roughages as a Factor in the Fattening Ration for Steer Calves, by W. L. Blizzard (p. 93); The Preparation of Feeds for Cattle.—II, A Study of the Chemical and Physical Composition of the Residual Ingesta in the Rumen at the End of a Twenty-four Hour Period, by C. H. Kick and P. Gerlaugh (pp. 93–98); Adjustment of Pork Production to Land Planning Program, by L. A. Weaver (pp. 98–100); The Value of Garbage in the Ration of Growing and Fattening Pigs,

by J. C. Miller (pp. 101–104); Expeller Processed Soybean Oil Meal Compared With Other Protein Supplements, by E. F. Ferrin (pp. 104–106); The Influence of the Protein Content of the Ration on the Growth and Fattening of Hogs Fed at a Moderately Restricted Level, by N. R. Ellis and O. G. Hankins (pp. 107–111); A Study of Ham Composition With Special Reference to Type of Hog, by O. G. Hankins and N. R. Ellis (pp. 111–116); A Method of Comparing Growthiness in Pigs Weighed At Different Ages and Subjected to Different Treatments, by J. H. Bywaters and O. S. Willham (pp. 116–119); The Relative Accuracy of One-day and Three-day Weights of Pigs, by F. Hale and C. B. Godbey (pp. 119–122); Readjustment of Horse Production to the Diversified Farm, by J. G. Fuller (pp. 122–126); Economical Pastures for Horses, by R. S. Hudson (pp. 127–129); Indiana Spring Stallion Shows, by P. T. Brown (pp. 129–131); Fundamental Horse Economics, by T. A. Ewing (pp. 131–134); Our Mule Supply, by J. O. Williams (pp. 135–137); Changes Which a Planned Utilization of Land May Bring in Sheep Production, by E. L. Potter (pp. 137–140); The Relation of Tip on Finewool Fleeces to Topmaking Qualities, by J. F. Wilson (pp. 141–144); Cross Sectional Variability of Wool Fibers, by J. I. Hardy (pp. 144–146); The Growth of Skin Area in Sheep, by R. H. Burns (pp. 146–151); Effect of Pregnancy and Early Lactation on Wool and Mohair Production, by J. M. Jones, B. L. Warwick, and S. P. Davis (pp. 151–153); Estrus and Ovulation in the Ewe.—A Preliminary Report, by C. E. Terrill (pp. 153–158); Supplements on the Winter Range for Breeding Ewes, by D. W. Chittenden, W. F. Dickson, and F. Barnum (pp. 159–161); The Efficiency of Feed Utilization in Lambs, by R. W. Phillips (pp. 161–163); The Influence of Fluorine on the Basal Metabolic Rate of the White Rat Fed Desiccated Thyroid, by P. H. Phillips (pp. 240, 241); The Balancing of Rations With Respect to Protein, by H. H. Mitchell and T. S. Hamilton (pp. 241–252); The Requirements of Phosphorus in the Ration of Growing Pigs, by C. E. Aubel and J. S. Hughes (pp. 253–258); Storing Chopped Alfalfa Hay in Ventilated Containers, by B. H. Roche (pp. 259–262); The Significance of Fat in the Rations of Farm Animals, by L. A. Maynard (pp. 263–267); Vitamin A in the Nutrition of Cattle and Swine, by E. B. Hart (pp. 267–274); Preserving Farm Dressed Beef in Freezer Storage, by K. F. Warner (pp. 275–278); Color Standard for Beef, by D. L. Mackintosh (pp. 279–281); Some Factors Related to Color of Meat, by D. L. Mackintosh and J. L. Hall (pp. 281–286); The Effect of Ingested Menhaden and Coconut Oils Upon the Firmness of Beef Fat, by F. J. Beard, J. A. Schulz, and C. C. Culbertson (pp. 286–290); and The Rate and Amount of Salt Absorption in Pork Curing, by P. T. Ziegler and R. C. Miller (pp. 291–293).

[Animal production and poultry studies in the Southern States] (*Assoc. South. Agr. Workers Proc., 36 (1935), pp. 483–504, 592–600*).—The following papers were presented before the animal production and poultry divisions at the thirty-sixth annual convention of the Association of Southern Agricultural Workers held at Atlanta, Ga., January 30 to February 1, 1935: A Comparison of Rations for Fattening Steer Calves, by W. L. Blizzard (pp. 485, 486); The Influence of Age on Cost of Finishing Cattle for Market, by R. H. Means (pp. 487, 488); Herd Improvement Investigations in Florida, by B. Knapp, Jr. (pp. 488, 489); The Fluctuation of Pig Weights, by F. Hale and C. B. Godbey (pp. 489–491); Influence of Individuality on Feed Consumption of Inbred and Outbred Pigs, by W. A. Craft (pp. 491, 492); Winter Forages for Fattening Hogs, by E. G. Godbey (p. 492); The Effect on Quality of Pork When Corn Treated With Paradichlorobenzene Is Fed to Hogs, by W. W. Henley (pp. 493, 494); Beef Production in South Florida, by W. F. Ward (pp. 494,

495); Production of Cattle Feed and Utilization of Stable Manures in Crop Rotation for Sugar Cane Production, by W. R. Dodson (p. 496); Summary of Market Trends of Livestock, by J. H. Noble (pp. 497, 498); The Effect of the Length of Time in Brine on the Salt Content of Hams, by J. C. Grimes, W. E. Sewell, and G. J. Cottier (p. 498); The Report on the Study of Cured Meat Storage, by J. B. Francioni, Jr. (p. 499); Comparative Study of Quality of Meat of Native versus Grade Hereford Yearlings, by J. E. Foster (pp. 500–502); What is Flushing? by L. E. Hawkins and A. E. Darlow (pp. 502, 503); The Effect of Drench Upon the Gains and Parasites of Lambs, by M. G. Snell (pp. 503, 504); The Supplementary Value of Peanuts to the Laying Ration, by D. F. King and G. J. Cottier (pp. 502, 503); Controlling Mortality in Laying Flocks, by E. F. Stanton (pp. 594, 595); The Influence of Treatments for Internal Parasites Upon Egg Production and the Relative Efficiency of Treatment, by W. L. Bleecker and R. M. Smith (p. 595); Economic Aspects of Chick Sexing, by H. L. Shrader (pp. 595, 596); Breeding as a Factor in the Control of Blindness and Paralysis, by C. W. Upp (pp. 596, 597); Some Chick Starting Rations, by C. L. Morgan and D. F. Sowell (pp. 597, 598); and Confinement versus Range Rearing of Chicks, by N. R. Mehrhof (pp. 598, 599).

[Investigations with livestock in Hawaii], L. A. HENKE (*Hawaii Sta., Anim. Husb. Div. Prog. Notes No. 14 (1936), pp. 15–18*).—Tests with livestock produced information on the value of bananas for fattening swine, the value of cassava meal, sweetpotatoes, and pineapple bran-molasses mixtures for fattening swine, pineapple bran as a feed for mules, and fattening beef steers on feeds produced in Hawaii.

[Investigations with livestock in Massachusetts] (*Massachusetts Sta. Bul. 327 (1936), pp. 19, 73, 74*).—Information was obtained on variations in efficiency of feed utilization in lambs, and the relation of birth weight to growth rate in lambs, both by R. W. Phillips.

In poultry tests, results were obtained on breeding poultry for egg production, by F. A. Hays and R. Sanborn; rate of feathering in Rhode Island Reds, and breeding for low mortality, both by Hays; and breeding for high and low resistance to fowl paralysis, by Hays, C. S. Gibbs, W. C. Sanctuary, and J. H Vondell.

[Investigations with livestock in New Hampshire] (*New Hampshire Sta Bul. 289 (1936), pp. 5, 6*).—Results are noted on the nutrition of the horse, pig, and goat, by E. G. Ritzman and F. G. Benedict; and breeding investigations with sheep, by Ritzman.

[Livestock investigations by the North Dakota Station] (*North Dakota Sta. Bul. 286 (1935), pp. 13–23, 77–79, figs. 2*).—Data obtained in tests with steers are reported on Trebi v. common barley, silage from mature v. immature corn, linseed meal v. safflower oil meal, effect of linseed meal in the fattening rations, effect of an increased amount of ground barley and less alfalfa and silage, shortening the feeding period, corn silage v. finely chopped corn fodder, and a comparison of emmer fed alone and in combination with barley to fattening steers, all by F. W. Christensen; a comparison of blighted barley of the 1933 crop with bright barley of the 1932 crop in fattening steers, by E. J. Thompson and V. T. Sander; a study of the influence of intensity and rotation of grazing on the character of the range and the quality and palatability of the beef produced, by P. F. Trowbridge, T. H. Hopper, Thompson, A. Severson, D. Berrigan, and J. T. Sarvis; and the influence of cooking and canning on the antineuritic and antipellagric vitamins in meat, by Christensen, E. Lebsky, and Hopper.

The swine tests included self-feeding compared with limited feeding, and a comparison of Trebi and Manchuria barley when fed to pigs, both by Severson.

Under sheep tests, preliminary feeding trials with emergency feeds were conducted, by Christensen; and a study of the inheritability of wool by market grades, by D. J. Griswold and Thompson.

The rate of growth of draft colts was determined by M. J. Kirk.

The poultry tests included farm flock demonstration in management and cost, and temperature studies in the artificial incubation of turkey eggs, both by G. P. Goodearl; barley v. corn in the ration for laying hens, cost of wintering turkey breeding stock, and feed costs of growing turkey poults, all by O. A. Barton; and rape v. alfalfa pasture for growing turkeys, and calcium supplements in the ration for turkey poults, both by Barton and F. E. Moore.

[**Livestock investigations by the Wisconsin Station**] (*Wisconsin Sta. Bul. 435 (1936), pp. 30–44, 52–54, figs. 3*).—Data obtained in tests with livestock are reported on the effect of the method of preparing soybean oil meal on its value as a protein supplement in pig rations, by G. Bohstedt, J. M. Fargo, and J. W. Hayward; the value of animal proteins for pigs on rape pasture, and cheese meal made from cheese trimmings as a supplement in hog rations, both by Bohstedt and Fargo; need of large quantities of skim milk, whey, and tankage for growing and pregnant gilts, by Fargo; the desirability of uniform grinding when barley is to be hand-fed to pigs, by Bohstedt, Fargo, B. H. Roche, F. W. Duffee, and H. D. Bruhn; the effectiveness of various types of soil for preventing anemia in suckling pigs, by Fargo; and the necessity of zinc in animal nutrition, by F. Stirn, E. L. Hove, C. A. Elvehjem, and E. B. Hart.

Investigations with poultry resulted in data on a comparison of the rates of growth and feed costs of capons and cockerels, by J. G. Halpin and G. E. Annin; the effect of sterilizing the ration with steam for 30 min. on the normal growth of chicks, by Halpin, C. E. Holmes, C. A. Herrick, and G. L. Ott; the availability of some calcium combinations to poultry, by H. J. Deobald, Halpin, Elvehjem, and Hart; the availability of iron and copper in a practical poultry ration for healthy laying hens, by M. Schultze, Elvehjem, Hart, and Halpin; the value of cheese meal, a byproduct from cheese trimmings, in the poultry ration, by Halpin and Holmes; properly prepared soybean oil meal for replacing part of the animal protein in poultry rations, by Halpin, Holmes, and Hayward; the effects of fluorine in the diet, by P. H. Phillips and Hart; and the distribution of fluorine in the tissues of laying hens, by Phillips, K. S. Haman, and Halpin.

A review of the experimental work with phosphate in Montana, 1928–1935: Phosphorus for animals, J. R. Green (*Montana Sta. Circ. 148 (1936), pp. 11–16, fig. 1*).—A series of tests indicated that more phosphorus was assimilated by cattle fed monocalcium phosphate than by those fed bone meal and that it was the cheaper phosphorus supplement. The appetite of herds of cattle, and of individuals in the herds, for monocalcium-salt mixtures varied with the season, with age and condition of the cattle, and with the feeding and management. Some herds would consume a mixture of equal parts of these salts, while others required a smaller proportion of monocalcium phosphate. Mixtures that had been wet and dried were less palatable than fresh mixtures. Broad shallow troughs were preferable to deep narrow troughs for feeding the mixtures. The wild hays and grasses were most likely to be deficient in phosphorus.

Colorado fattening rations for cattle, H. B. Osland, E. J. Maynard, and G. E. Morton (*Colorado Sta. Bul. 422 (1936), pp. 120, figs. 28*).—Results are reported of beef cattle feeding experiments carried on to determine the feeding

values for calves and 2- and 3-year-old steers of concentrates such as corn, barley, and wheat; various beet byproducts, including wet, dried, and pressed molasses beet pulp, beet molasses, and beet tops in comparison with corn, barley, cull potatoes, and corn silage; carbonaceous roughages, such as corn silage, corn and soybean silage, corn fodder, sunflower silage, cull potatoes, and potato silage; and protein concentrates, including cottonseed cake, linseed cake, and flaxseed. Other experiments on which reports were presented were concerned with comparisons of steers with open heifers, influence of age and weight, market grades, and comparative methods of marketing steers by truck and rail.

The comparative values of eight protein supplements in stock cattle winter rations, C. W. McCAMPBELL and L. C. AICHER (*Kansas Sta., Fort Hays Substa., Beef Cattle Invest., 1935–36, pp. 4*).—In this experiment 8 lots of 10 calves each were fed the same amounts of early sumac cane silage daily for 150 days. In addition the respective lots received 1 lb. per head per day of the following protein supplements: Cottonseed meal, linseed meal, soybean oil meal, peanut oil meal, corn gluten meal, tankage, wheat bran (3 lb.), and alfalfa hay (4 lb.). The average daily gains in the respective lots were 1.3, 1.2, 1.2, 1.2, 1.2, 1.1, 1.5, and 1.4 lb. All supplements were readily eaten, and the weight gains in all lots were satisfactory. As the gains in lots 7 and 8 were significantly greater than those in the first six lots, 3 lb. of wheat bran and 4 lb. of alfalfa were worth more under the conditions of this test than 1 lb. of any of the other supplements.

Vitamin A deficiency, a cause of lameness and death among swine, E. H. HOSTETLER, J. E. FOSTER, and J. O. HALVERSON (*North Carolina Sta. Tech. Bul. 52 (1935), pp. 31, figs. 14*).—Experiments were carried on in 1929, 1930, and 1931 with 7, 4, and 6 pigs, respectively, on a basal ration of white corn, fish meal, and minerals which had produced characteristic symptoms in previous experiments due to a deficiency of vitamin A. Supplementing the basal ration by the substitution of yellow corn for white corn or 5% percent of alfalfa meal added to the ration or 1 oz. of cod-liver oil per day corrected the deficiency. Nearly all of the pigs exhibiting the deficiencies were cured when the vitamin A carriers were added to the basal ration. Confirmatory results were obtained in similar experiments with rats.

Determinations of the vitamin A content of the livers of the pigs and the rats showed that those on the basal ration were deficient in vitamin A, whereas the livers of pigs and rats receiving the supplements contained vitamin A. It was proved that vitamins D, B, and G were not factors in causing the difficulties since the pigs were exposed to direct sunlight and the ash and calcium contents of the bones were normal. Supplements of vitamins B and G to rat rations causing the deficiencies showed no improvement.

National poultry improvement plan (*U. S. Dept. Agr., Bur. Anim. Indus., Anim. Husb. Div., A. H. D. No. 14 (1935), pp. 13*).—This publication describes the national poultry improvement plan developed by the Department, the primary purpose of which is to identify, authoritatively, poultry breeding stock, hatching eggs, and chicks with respect to quality by describing them in terms uniformly accepted in all parts of the country.

The feasibility of sex segregation in day-old chicks, M. A. JULL (*Poultry Sci., 13 (1934), No. 4, pp. 250–254, figs. 4*).—A tabulation of the success in sexing day-old chicks by four investigators on the staff of the U. S. D. A. Animal Husbandry Experiment Station, Beltsville, Md., with an accuracy of about 90 percent, is reported. Descriptions are given of differences in the copulatory organs as used in determining the sex of young chicks.

Sexing baby chicks, C. S. GIBBS (*Poultry Sci., 13 (1934), No. 4, pp. 208–211*).—Directions for sexing baby chicks at hatching.

Feed consumption and growth standards, F. P. JEFFREY (*New Jersey Stas. Hints to Poultrymen, 23 (1936), No. 3, pp. 1*).—Feed consumption and growth standards of White Leghorns and Barred Plymouth Rock chickens and Bronze and White Holland Turkeys from birth to 24 weeks of age, based on records of several thousand normal birds hatched from February to May, are presented.

The influence of certain protein levels on the growth of pullets, R. S. DEARSTYNE, C. O. BOLLINGER, G. K. JONES, and H. P. BRIGMAN (*North Carolina Sta. Bul. 304 (1936), pp. 16, figs. 6*).—This study was undertaken at the Coastal Plain and Mountain Branch Stations to determine whether or not the lowering of the protein level of the open formula developing mash recommended by the State extension office could be accomplished without delaying the development of the birds. Rations containing three different protein levels were fed.

The results showed no significant difference in the development of the body weight, time required for sexual maturity, or pullet year production for the groups of birds fed mashes with the different protein levels. In general, it appeared that the high protein level of 17.5 percent was not warranted and that a level of 15 percent gave just as satisfactory results. There appeared also to be a possibility of still further reduction in the protein level without injury to the future performance of the birds.

Ground soybeans as a protein supplement for laying birds, A. E. TOMHAVE and C. W. MUMFORD (*Delaware Sta. Bul. 197 (1936), pp. 37, fig. 1*).—Data are reported on the influence on egg production of replacing part or all of the meat scrap and dried buttermilk by ground soybeans in the rations of pullets and laying hens in six experiments. The results showed that reduced egg production followed the replacement of meat scrap and buttermilk by ground soybeans. The decrease was especially important when more than 6.8 percent of soybeans were included in the rations. The reduced egg yield was not due to the higher fat content of the beans. Ground soybeans had no effect on the storage quality and breaking strength of the eggs. In the studies with yearling hens soybeans furnished a more satisfactory replacement. They did not consistently lower production, and there was no effect on hatchability.

Eight years' experiences with losses of pullet layers, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul. 180 (1936), pp. 63–69, fig. 1*).—Over an 8-yr. period various sanitary management tests were conducted with chicks, pullets, and layers in an effort to reduce losses from infections. In addition, day-old chicks were shipped to two of the county experiment farms where they were brooded and the pullets raised until about ready to lay. At this time one-half of them were returned to Wooster for observation.

The various management tests failed to protect the chicks and growing pullets from exposure to infection. However, this protection seemed to be afforded by shipping the day-old chicks to the farms, where there was no infection, and raising them there. Disposal of all older birds 2 to 4 weeks before starting day-old chicks appeared to be the most effective means for the control of disease. In spite of all the control measures undertaken, chicks raised on the same farm with older birds became infected. Ready-to-lay pullets or pullets about 5 mo. old appeared to be resistant or immune to disease. The breeding birds in the station flock did not transmit diseases to their offspring.

Appended are (1) a discussion of disease carriers v. soil and premises as a means of disease transmission and (2) a summary of recommendations based on present knowledge.

Summer broiler production, R. S. DEARSTYNE, H. D. SMITH, and H. P. BRIGMAN (*North Carolina Sta. Bul. 303 (1936), pp. 16, figs. 3*).—During 1934 and 1935 five groups of chicks were hatched and carried through the fattening batteries. The birds were kept for 10 days in starting batteries, placed on native range, and then returned to batteries for an intensive fattening period of about 9 days. The work was carried on at the Mountain Branch Station.

The tests showed that where an economic electric rate existed starting batteries were justified in broiler production. Gains of 50 and 81 percent were made with lots of 825 and 1,037 chicks on a mash intake of 2.2 and 2.9 oz. per chick, respectively, in starting batteries. With adequate ventilation the batteries could be successfully used during the summer season. Range studies showed no correlation between season and mortality. As the season advanced there appeared to be a decrease in mash consumption and an increase in grain consumption, and this was reflected in a greater number of days required to bring late-hatched birds to the same weight as early-hatched birds. The gain per unit of feed intake on range showed no relation to season.

In 1934 cockerels fattened on rations with skim milk as the animal protein supplement gained 24.5 percent body weight as compared with 22.6 percent on a similar ration in which meat scrap was used as the animal protein. In 1935 the gain on the milk ration was 19.5 percent and on the meat scrap ration 17.5 percent. Pullets fed the milk ration in 1934 gained 26.4 percent body weight and those on meat scrap 18.6 percent, while in 1935 the gains were 23.5 and 20.5 percent, respectively.

Time interval between eggs of Rhode Island Red pullets, F. A. HAYS (*Jour. Agr. Res. [U. S.], 52 (1936), No. 8, pp. 633–638, figs. 3*).—A group of 409 pullets was trap-nested hourly at the Massachusetts Experiment Station for a full laying year to obtain data on the relationship between the time interval between eggs within the clutch and some important fecundity and reproductive characters.

The shortest interval between eggs was reached during the month of April, while the greatest time interval occurred during the months of lowest production. During the winter short time intervals were characteristic for birds showing large clutch size. Maximum egg weight in the hatching season occurred in birds averaging 25.5 hr. between eggs to March 1. When the time interval was above or below this point there was a decrease in egg size, and there were indications that such a condition was associated with low hatchability. Each increase in winter time interval tended to be followed by decreased persistency. Short winter time interval was definitely associated with high annual egg production, and may have a definite value in predicting the egg record for the pullet year.

Winter pause in Rhode Island Reds, F. A. HAYS (*Massachusetts Sta. Bul. 329 (1936), pp. 11, fig 1*).—A study was made of certain environmental and hereditary characters to discover what effect they might have on the presence or absence of winter pause and on the duration of winter pause in production-bred Rhode Island Reds.

Birds hatched in March showed a somewhat higher incidence of winter pause than those hatched in April. Date of hatching gave a negative correlation with pause duration of 0.2366 ± 0.0242. Neither age nor body weight at first egg was associated with pause duration. Short intervals between eggs of a clutch during any winter month, large winter clutch size, and ability of pullets to lay large numbers of eggs before pausing had a tendency to shorten the winter pause. A significant reduction in pause duration was in general associated with long periods of previous egg production. Short pauses were likely to be

followed by greater egg production than were long pauses. Winter pause significantly reduced winter egg production. The mean winter egg record for pause birds was 78.95 and for nonpause birds 102.9. The mean body weight from housing up to March 1 was practically the same for pause and nonpause pullets and showed no relationship to pause duration. Pauses of less than 7 days' duration were probably due to different causes than longer pauses. Laying-house mortality was not reduced nor was hatchability increased by the presence of winter pause.

Incubation experiments with turkey eggs, J. H. MARTIN and W. M. INSKO, JR. (*Kentucky Sta. Bul. 359 (1935), pp. 151–177, figs. 4*).—Data are reported on the embryonic temperature of turkey eggs incubated naturally and in forced-draft and sectional incubators. These data showed the embryo temperatures of eggs in the incubators to be slightly below those naturally incubated during the first and second weeks. Studies on growth and mineral metabolism showed practically no change until about the twelfth day, when weight increases were noted. Mineral changes were observed from the seventeenth to the eighteenth days of the incubation period.

The critical stages for mortality were early in incubation, with a second critical stage near the latter part of the incubation period. The best hatch, 77.4 percent, was obtained in a sectional incubator with temperatures during the incubation period of 100.5°, 101.4°, 102.6°, and 103° F. during the first, second, third, and fourth weeks, respectively, as contrasted with other temperature variations. The position of the egg was not related to hatchability, but the eggs should be turned at least four times daily during artificial incubation.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle in Hawaii] (*Hawaii Sta., Anim. Husb. Div. Prog. Notes No. 14 (1936), pp. 2–14*).—The results obtained in tests with dairy cattle are reported on the milk and butterfat production of the dairy herd, by G. W. H. Goo; the results of the agglutination abortion tests, by L. A. Henke; the composition and bacteriological content of the milk produced by the university dairy herd; pineapple bran v. beet pulp as supplements to grain rations for dairy cows; the value of a cassava-coconut oil cake meal combination for dairy cattle; rations using maximum amounts of pineapple bran and cane molasses; green alfalfa v. green Sudan grass; Napier grass fed whole v. cut Napier grass as a roughage; and green Napier grass v. green Sudan grass as roughages.

[Studies in dairying at the North Louisiana Substation], S. STEWART (*Louisiana Sta., North Louisiana Sta. Rpt. 1935, pp. 21–24*).—Results obtained in tests to determine how dairying and feed production can supplement cotton farms are reported, together with data on pasture studies and the value of a trench silo. These studies were made in cooperation with R. H. Lush.

[Investigations with dairy cattle and dairy products in Massachusetts] (*Massachusetts Sta. Bul. 327 (1936), pp. 16, 35, 36, 37*).—Data obtained in tests with dairy cattle are reported on the proper supplementary ration for milking cows on pasture, by J. G. Archibald, V. A. Rice, R. C. Foley, and C. H. Parsons.

Tests with dairy products yielded information on the effect of high initial aging temperatures on the basic viscosity and gel strength of gelatin solutions, by W. S. Mueller; some factors affecting the properties of whipped cream, by Mueller, M. J. Mack, and H. G. Lindquist; and the changes that occur in the storage of frozen sweet cream, by Lindquist.

[Investigations with dairy cattle and dairy products in New Hampshire] (*New Hampshire Sta. Bul. 289 (1936), pp. 4, 5, 6, 7, 15, 20*).—Data obtained in studies with dairy cattle are reported on digestion experiments with oat hay, the lability of the dairy cow's basal metabolism, and the effect of feeds on rumination of cows, all by E. G. Ritzman and F. G. Benedict; and a study of the economics of dairy herds in the southern part of the State, with special reference to diseases, by H. C. Grinnell.

Experiments with dairy products yielded data on the hemolytic streptococci in pasteurized milk, by L. W. Slanetz; and abnormal relationship of fat to solids-not-fat in milk, by H. C. Moore.

[Experiments with dairy cattle and dairy products in North Dakota] (*North Dakota Sta. Bul. 286 (1935), pp. 48–55*).—Investigations with dairy cattle produced results on barley v. corn for dairy cows, breeding dairy cattle—pure for high production, the value of tankage v. cottonseed meal as a feed for dairy cows, and performance in shed barns v. dairy barns, all by J. R. Dice; and the results of 4 yr. of a Holstein breeding circuit, by H. Buss.

With dairy products information was obtained on the influence of various methods of the partial neutralization of sour cream on butter, varying pasteurization exposures upon butter, and various flavor- and aroma-producing substances on butter, all by C. Jensen; and a study of ice wells in farm refrigeration.

[Investigations with dairy cattle and dairy products at the Wisconsin Station] (*Wisconsin Sta. Bul. 435 (1936), pp. 44–52, 68–78, 85–87, figs. 2*).—Investigations with dairy cattle are reported on the effect of different types and amounts of protein and minerals in home-grown rations upon growth and milk production, by I. W. Rupel, G. Bohstedt, and E. B. Hart; the keeping qualities and storage value of chopped hay, by F. W. Duffee, L. F. Graber, Bohstedt, B. H. Roche, and Hart; and the feasibility of ensiling alfalfa by the A. I. V. method and the use of molasses instead of mineral acids for preserving it, by W. H. Peterson, Hart, H. R. Bird, Bohstedt, W. M. Beeson, Rupel, and E. B. Fred.

In nutrition studies with dairy cattle, data are given on the addition of grass juice, liver, or brain material for improving the growth-promoting qualities of winter milk, by C. A. Elvehjem and Hart; the necessity for fat in the efficient utilization of lactose, by E. J. Schantz, Elvehjem, and Hart; and the use of iron and copper in curing goat's milk anemia, by G. O. Kohler, Elvehjem, and Hart.

With dairy products, information was obtained on the factors responsible for unusual flavors in irradiated milk, by K. G. Weckel, H. C. Jackson, R. Haman, and H. Steenbock; the relation of the irradiated flavor to constituents of milk, by Weckel and Jackson; a test to measure the stability of butterfat to oxidation, by V. C. Stebnitz and H. H. Sommer; a comparison of various new materials with copper in heat transference when used in dairy plant equipment, by L. C. Thomsen; a study of various emulsifiers for processed cheese, by H. L. Templeton and Sommer; controlling bitterness in Cheddar cheese resulting from acidity in the curd-making process, by C. A. Phillips and W. V. Price; a study of the yeasts causing a gas defect in cream cheese, by W. J. Corbett, W. C. Frazier, and Price; acidity in the manufacture of cream cheese, by Z. D. Roundy and Price; the inaccuracy of the methylene blue test for measuring the bacterial content of milk from mastitis-infected cows, by E. G. Hastings; and the relation between abnormal milk and mastitis, by Hastings and F. B. Hadley.

Producing better dairy cattle, H. S. WILLARD and W. L. QUAYLE (*Wyoming Sta. Bul. 215 (1936), pp. 20, figs. 4*).—The history of the development of the present university Holstein-Friesian dairy herd at Laramie, Archer, Afton, and Lyman is reported. In the development of these herds 12 sires were used, 7 of which sired daughters which averaged more butterfat than their dams. It is pointed out that in developing a herd constant attention must be given to the selection of superior sires and in culling low-producing cows if improved production is to be attained.

All-year pasturing with and without concentrates for dairy cattle, B. P. HAZELWOOD (*Tennessee Sta. Circ. 58 (1936), pp. 4, fig. 1*).—This study was undertaken to determine the practicability of producing milk when no grain was fed to cows supplied with all-year pasture, alfalfa hay, and silage. The pasture used consisted of crimson clover for late fall, winter, and early spring use, and permanent pasture supplemented with Sudan grass for the remainder of the year. Alfalfa hay was available all the year when the cows were in the barn. The silage used was corn and sorghum, which was fed at the rate of about 3 lb. per 100 lb. of live weight. The cows receiving grain were fed at the rate of 1 lb. of mixture per 3 lb. of milk produced.

Over a period including 5 winters an average of 340 days of pasture was available out of every 375 days' lactation. The butterfat production of the cows receiving no grain was 92 percent of that of the cows fed grain. The no-grain cows obtained 74 percent of their feed supply from pasture as compared with 52 percent for the grain-fed cows. There was no apparent difference in the physical conditions of the two groups.

Wet feeds versus dry feeds for milk production, A. D. PRATT (*Virginia Sta. Bul. 301 (1936), pp. 10, fig. 1*).—The results are reported of double reversal comparisons of dried commercial sugar beet pulp with moistened sugar beet pulp, and corn silage with corn silage artificially dried, for milk production.

The results indicated that the nutritive values of dried and wet beet pulp and normal and artificially dried corn silage were approximately equal when considered on a dry matter basis. The greater water intake of the cattle receiving the wet feeds did not influence milk production.

Pea vine silage as a feed for dairy cattle, J. O. TRETSVEN (*Montana Sta. Bul. 317 (1936), pp. 11*).—In two trials conducted by the reversal method with 16 cows in each trial, a comparison was made of pea vine silage fed with alfalfa hay and concentrates according to production and the alfalfa hay and concentrates fed alone. Production was approximately equal on the two rations. When fed under suitable precautions, the pea vine silage had no influence on the flavor of the milk produced. Two trials with dairy heifers also showed similar results for rations with and without pea vine silage. For milk production and growth the silage was worth approximately one-third the value of alfalfa hay.

Pathology of rickets in dairy calves, H. E. BECHTEL, E. T. HALLMAN, C. F. HUFFMAN, and C. W. DUNCAN (*Michigan Sta. Tech. Bul. 150 (1936), pp. 47, figs. 34*).—A description is given of the histological changes in 11 dairy calves from 151 to 520 days of age which were suffering from vitamin D deficiencies in comparison with 5 normal calves. The changes in the bones were accompanied by decreased concentrations of calcium and/or inorganic phosphorus in the blood plasma. The best index of rachitic changes in the skeleton was observed in the picture of the costochondral junction at the ventral end of the rib. Other changes in the histology of bone formation were described. More severe symptoms of rickets were associated with more rapid growth. Abnormal accumulations of bile were observed in several of the calves at post mortem, and enteritis occurred in a few cases.

Maintenance of grade A milk: A study of the factors affecting quality, returns and premium losses, E. H. RINEAR and H. C. MOORE (*New Hampshire Sta. Bul. 291 (1936), pp. 24, figs. 2*).—This study of the factors affecting quality, returns, and premium losses is based principally on data for 1931, 1932, and 1933, secured from 82 grade A and 20 grade B producers shipping milk to Boston through the Pattee receiving station at West Canaan, N. H., and records from 24 producers of Monroe, N. H., from which place only B grade milk was shipped.

The average premiums paid to grade A producers ranged from $196 58 in 1931 to $142.07 in 1933. The premiums during the 3 yr. studied represented 12 to 14 percent of the gross milk receipts. Little correlation was found between the dairy scores made by the inspector for the Boston Board of Health and the bacteria counts of the same grade A producers. Of the producers having high bacteria counts, the loss of premiums was traced to a lack of sterilizing the equipment for 38 percent, poor cooling for 20 percent, gargety milk for 21 percent, and labor problems for 13 percent. From 1931 to 1933, troubles from improper sterilization and cooling declined but the trouble with gargety milk increased. The most important differences between grade A and grade B producers were in milking practices, washing and sterilizing of equipment, amount of ice used, and time used in sterilizing.

Twenty-first annual report of the creamery license division, T. H. BINNEY (*Indiana Sta. Circ. 215 (1936), pp. 16, fig. 1*).—This is the usual report of the State creamery license division for the year ended March 31, 1935 (E. S. R., 73, p. 535). The report deals with the comparative annual production of dairy products in Indiana, the creamery inspection, and the examination of testers.

VETERINARY MEDICINE

[Report of work in animal pathology by the Massachusetts Station] (*Massachusetts Sta. Bul. 327 (1936), pp. 74–78*).—In reporting for the year (E. S. R., 73, p. 676) reference is made by H. Van Roekel, K. L. Bullis, O. S. Flint, and M. K. Clarke to the progress of pullorum disease eradication work, a report of which has been noted (E. S. R., 74, p. 400), pullorum disease investigations, diagnostic service, flock morbidity and mortality studies, "epidemic tremors" in chickens, and disease studies in ruffed grouse. Additional work with laryngotracheitis and colds is reported upon by C. S. Gibbs, and on differentiation of the pathological cell in neurolymphomatosis from lymphocytes of the blood of chickens, the differentiation of neurolymphomatosis from lympholeucosis, and a study of "pearly eye" in neurolymphomatosis, all by Gibbs and C. G. Johnson.

[Report of work in animal pathology by the North Dakota Station] (*North Dakota Sta. Bul. 286 (1935), pp. 23–26, 47*).—The work for the period 1932–35 referred to (E. S. R., 67, p. 739) includes avian tuberculosis, by G. S. Harshfield, L. M. Roderick, and M. C. Hawn; feed lot losses among lambs, by Roderick, Harshfield, and Hawn; pregnancy disease of sheep, by Roderick, Harshfield, Hawn, and T. H. Hopper; infectious proventriculitis of turkeys, by Hawn; sweetclover disease of cattle, by Roderick; the Bang's disease control program, by Hawn, Harshfield, and Roderick; and prussic acid poisoning by grain- and sweet-sorghum and Sudan grass, by Hopper, L. L. Nesbitt, and A. J. Pinckney.

[Report of work in animal pathology and parasitology by the Wisconsin Station] (*Wisconsin Sta. Bul. 435 (1936), pp. 21, 22, 25–27, 54–56, 79, 80*).—The work of the year in animal pathology and parasitology referred to (E. S. R., 74, p. 539) includes the question of transmission of Bang's disease by casual

reactors that mingle with susceptible animals, by B. A. Beach and G. C. Humphrey; the development of a rapid chlorine test for mastitis, by E. R. Carlson; factors affecting the control of coccidiosis, by C. A. Herrick, G. L. Ott, J. G. Halpin, and C. E. Holmes; a study of the effects of internal parasites on egg production and hatchability, by Herrick, Halpin, and Holmes; the mechanics of selenium poisoning traced to effects on enzyme systems, by V. R. Potter and C. A. Elvehjem; and limitations of the tuberculin test, by E. G. Hastings, J. McCarter, and Beach.

[**Livestock diseases in Jamaica**], S. Lockett (*Jamaica Dept. Agr. Ann. Rpt., 1934, pp. 13–20*).—The occurrence of and control work with bovine tuberculosis, infectious bovine abortion, cattle tick fever, and other diseases of livestock are reported upon.

Annual report of the Civil Veterinary Department, Bihar and Orissa, for the year 1934–35, P. B. Riley (*Bihar and Orissa Civ. Vet. Dept. Ann. Rpt., 1934–35, pp. [81], pl. 1*).—An account of the occurrence of and control work with infectious and parasitic diseases of livestock takes up a large part of this report (pp. 10–21, 27–33).

Report on the Veterinary Department, Burma, for the year ending the 31st March 1934, D. T. Mitchell (*Burma Vet. Dept. Rpt., 1933–34, pp. [2]+28, pls. 5*).—A brief account of the occurrence of and control work with diseases of animals and of veterinary research is included in this report (E. S. R., 71, p. 241).

[**Work in animal pathology in Mysore**], S. D. Achar (*Mysore Serum Inst. Ann. Rpt., 1935, pp. 11*).—This report of work with infectious diseases of livestock in Mysore deals particularly with the biological products that may be used against rinderpest, hemorrhagic septicemia, anthrax, blackleg, and sheep pox, the details of which are presented in table form.

Animal health investigations, G. A. Julius et al. (*Austral. Council Sci. and Indus. Res. Ann. Rpt., 9 (1935), pp. 34–41*).—The work of the year 1934–35 (E. S. R., 73, p. 678) with infectious diseases and parasites of livestock is reported upon.

[**Contributions on animal pathology and parasitology**] (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 5 (1935), No. 2, pp. 363–471, figs. 3*).—The contributions here presented (E. S. R., 74, p. 539) are as follows: The Bloedpens Strain of *Cl[ostridium] welchii*, Type B, Wilsdon (the "Lamb Dysentery Bacillus") (pp. 363–389) and The Production of Immunity Against *Cl[ostridium] welchii*, Type B, Wilsdon (the "Lamb Dysentery Bacillus") (pp. 391–416), both by J. H. Mason; The Chemotherapy of Oesophagostomiasis in Sheep, II, by H. O. Mönnig (pp. 419–438); The Toxicity of Pumpkin Seed (*Cucurbita pepo* L.), by D. G. Steyn (pp. 441–443); The Occurrence of Cyanogenetic Glucosides in South African Species of *Acacia*—II, Determination of the Chemical Constitution of Acacipetalin: Its Isolation from *Acacia stolonifera* Burch., by C. Rimington (pp. 445–464); and The Toxicity of Trypan Blue, by D. G. Steyn (pp. 467–471).

Immunity, premunition, and natural resistance [trans. title], E. Sergent and L. Parrot (*Arch. Inst. Pasteur Algérie, 13 (1935), No. 3, pp. 279–319, fig. 1*).—Attention is drawn to the differences between immunity and premunition, the latter being conferred artificially only by living virus vaccines.

Premunition and premunitive vaccination in veterinary pathology [trans. title] A. Donatien and F. Lestoquard (*Bul. Acad. Vét. France, 8 (1935), No. 2, pp. 125–131; abs. in Vet. Rec., 16 (1936), No. 5, pp. 112, 113*).—In the course of this discussion it is pointed out that while the premunition form of immunity plays an important part in decreasing the economic importance of

certain diseases, the premune animal remains a permanent reservoir of infection and a potential danger to all susceptible animals in the neighborhood.

Bact. aertrycke endotoxin: A study on its production, detoxication, and the practical utilization of its antigenic properties, E. GRASSET, A. ZOUTENDYK, and A. SCHAAFSMA (*Brit. Jour. Expt. Path., 16 (1935), No. 5, pp. 454–460*).—In the study of a recently isolated and highly virulent strain of *B. aertrycke* responsible for an acute outbreak of food infection, a potent endotoxin was obtained by alternate freezing and thawing of concentrated killed emulsions.

"The toxic autolysates were rendered atoxic by the action of 0.6 percent of formalin in the course of 6 weeks' incubation at 37° C. The antigenic properties of the detoxicated autolysates have been demonstrated by the immunization of mice and rats. The hyperimmunization of horses gave rise to sera possessing specific and high agglutinating properties, flocculating properties, and considerable antibacterial and antitoxic values as proved by tests in vivo and in vitro. The concentration and refinement of the horse serum is now being investigated. The investigation tends to show that the [*B.*] *aertrycke* antiserum may be utilized with satisfactory therapeutic results should the necessity arise."

Observations on Myxomatosis cuniculi (Sanarelli) made with a view to the use of the virus in the control of rabbit plagues, C. J. MARTIN (*Austral. Council Sci. and Indus. Res. Bul. 96 (1936), pp. 28, figs. 2*).—A study of the epidemiology of a highly specific virus found to affect only the European rabbit (*Oryctolagus*) and its domesticated varieties is reported upon. The two strains of the virus were used in the experiments, one of low and variable virulence and the other of higher and more fixed virulence.

The prevention of myiasis in wounds of domestic animals by the use of "bone oil", J. A. HOWARTH (*Jour. Amer. Vet. Med. Assoc., 88 (1936), No. 5, pp. 628, 629*).—In work conducted in California during the summer and fall of 1935 the author obtained satisfactory results in protecting open wounds in cattle, sheep, horses, and hogs from flesh flies through applications of bone oil. Following the use of benzol for the destruction and removal of larvae from wounds infested with the screwworm (*Cochliomyia macellaria*) and other maggots, bone oil was applied. In no case was there a reinfestation of the wound, and healing was exceptionally rapid showing no detrimental effect of the bone oil on the tissue. In one case th's repellent was successfully used on the wound of a sheep where the raw surface had an area of approximately 1 sq. ft. There appeared to be no absorption of toxic material, and healthy granulation and repair took place without an excessive amount of exudate. From the success in treating wounds already infested, it appears that the use of bone oil in immediately coating wounds caused by castration, dehorning, branding, shearing, barbed-wire cuts, etc., would be an effective safeguard against myiasis. It is thought that the product can be marketed at a price which will render it practical for extensive use in the animal industries.

Timber milk vetch as a poisonous plant, I. E. NEWSOM, F. CROSS, B. R. MCCRORY, A. H. GROTH, J. W. TOBISKA, E. BALIS, L. W. DURRELL, E. C. SMITH, and E. N. STOUT (*Colorado Sta. Bul. 425 (1936), pp. 42, figs. 7*).—Studies of a chronic disease of cattle running on summer range on Blue and Douglas Mountains in the extreme northwestern part of Colorado, which develops in the late summer and manifests itself mostly in lactating animals, are reported upon. The more prominent symptoms include incoordination of gait, weaving, clicking the heels together, emaciation, weakness, husky voice, the urine passed in spurts on driving, and, finally, paralysis and death. Poisoning by the timber milk vetch (*Astragalus hylophilus*) growing on the range having been

suspected, feeding experiments were conducted which led to the production of the disease in both cattle and sheep. It then developed that severe losses in sheep in the same territory, which had not been associated with cattle loss because they were more acute, could also be attributed to the same weed. Numerous examinations of the forage to determine whether selenium played any part were negative. No toxic substance was demonstrated by feeding either the plant itself or the watery or alcoholic extracts to guinea pigs.

Colorimetric methods for determination of inorganic calcium and phosphorus in blood serum, a method for determination of available calcium and phosphorus in soils (CO_2 extraction method), and a method for calcium and phosphorus in grasses and herbage are taken up in an appendix.

Reticuloendothelial proliferations in domestic animals, H. BERTHELSEN (*Skand. Vet. Tidskr., 26 (1936), No. 3, pp. 146–168, pls. 2; Eng., Swed. abs., pp. 165, 166*).—Cases of reticuloendothelial proliferations in the dog, cat, foal, fox, and cow are reported upon.

The ticks and the diseases which they transmit to domestic animals in Madagascar [trans. title], G. BÜCK (*Rev. Agr. Maurice, No. 84 (1935), pp. 196–209, pls. 6*).—The first part of this contribution deals with the principal ticks of Madagascar (pp. 196–198), the second part with the diseases of animals on the island transmitted by ticks (pp. 198–207), and the third part with the means of tick control and disease prevention (pp. 207–209).

Spontaneous virus diseases in common laboratory animals: Mice, rats, cats, and monkeys, J. THOMPSON (*Arch. Path., 21 (1936), No. 4, pp. 531–540*).—The various diseases caused by viruses and analogous conditions in mice, rats, cats, and monkeys are briefly summarized by the author. "In the past experimental studies have been devoted almost exclusively to the investigation of the more pathogenic viruses. However, those which do not show distinctive clinical signs are of interest. That such viruses may be potentially pathogenic should not be overlooked. The recent demonstration of an etiologic factor in two cases of aseptic meningitis in man identical with the virus-producing lymphocytic choriomeningitis in mice and monkeys, as well as the isolation of virus B from a person in whom an ascending paralysis developed and who died following a bite from a monkey, suggests that the animal kingdom is an incompletely probed reservoir of human virus disease."

Studies on hemolytic streptococci.—I, Methods of classification, A. C. EVANS (*Jour. Bact., 31 (1936), No. 4, pp. 423–437*).—The methods used by the author for the study of 573 strains of hemolytic streptococci are described, the value of the various tests for classification purposes is discussed, and a few relatively simple tests are selected by which unknown strains may be identified with species to be described in subsequent papers of this series. A list of 36 references to the literature is included.

Salmonella enteritidis (Gärtner) and its varieties [trans. title], E. SAVINO (*Rev. Inst. Bact. [Argentina], 6 (1935), No. 5, pp. 677–686*).—A report is made of the study of the seven varieties of *S. enteritidis*, namely, *enteritidis, danysz, chaco, essen, dublin, rostock*, and *moscú* (*moscow*), with a list of 33 references to the literature.

Rocky Mountain spotted fever, with special reference to the disease in Maryland, C. H. HALLIDAY (*Md. Conserv., 13 (1936), No. 2, pp. 3–7, figs. 6*).—A tick survey in Maryland is said to have shown the American dog tick, a transmitter of the infection, to be widely distributed, having been found in the adult stage on dogs, horses, cattle, and man.

The pathogenic action of Trichomonas foetus on the central nervous system [trans. title], S. NICOLAU and A. LWOFF (*Ann. Inst. Pasteur, 55 (1935),*

No. 6, pp. 654–675, figs. 24).—The rabbit, guinea pig, mouse, rat, dog, monkey, and fowl have been found to be susceptible to *T. foetus* when inoculated intradurally. In all of these except the rat such infection produces a peracute, acute, or chronic meningoencephalomyelitis. The organism shows a predilection for the cerebral ventricles, with a tendency to destroy the cerebral tissue.

The effect of low temperature upon trypanosomes (Trypanosoma equiperdum) in the organism of mammals, N. P. KALABUCHOV and L. B. LEVINSON (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 1 (1936), No. 1, pp. 47–50*).—Experiments are reported in which two species of bats (*Nyctalus noctula* Schr. and *Pipistrellus nathussi* Keys & Blas.) were infected with *T. equiperdum*, which multiplied very quickly. It was found that at a temperature ranging from 3° to 4° C. (body temperatures of from 3.5° to 6.7°), infection in the bats did not develop at all, and did not develop later when the bats were warmed. Placed in ice boxes on the third or fifth day after the number of trypanosomes in the blood had reached a high level, they disappeared and failed to reappear in the blood after exposure to normal temperatures.

Intracerebral inoculation of fetal guinea pigs with Bacille Calmette-Guérin and the H_{37} strain of tubercle bacillus, I. S. NEIMAN and O. C. WOOLPERT (*Amer. Jour. Path., 12 (1936), No. 2, pp. 153–164, pl. 1*).—The authors report upon studies in which "guinea pig fetuses were inoculated with graded doses of B. C. G. and the effects compared with those obtained in a similar series inoculated with virulent tubercle bacilli (H_{37}). Both types of tubercle bacilli were found to spread from the site of inoculation but not with equal rapidity; with the same dose, it took a longer time for B. C. G. to cause as much pathology, in the animal as a whole, as H_{37}. Pathologically the response of the fetus to both organisms was the same. Histological evidence has been brought forward to show that B. C. G. is capable of multiplying in fetal tissues and of initiating a disease process different only in degree from that produced by H_{37}. So far, attempts at fetus-to-fetus transfer of B. C. G. have not been successful. Recovery of this bacillus on artificial media from inoculated fetuses was accomplished 4 times in 24 attempts."

Bovine pulmonary tuberculosis in man: Twenty-six cases from Copenhagen, F. TOBIESEN, K. A. JENSEN, and H. C. A. LASSEN (*Tubercle, 16 (1935), No. 9, pp. 385–396; abs. in Arch. Path., 21 (1936), No. 5, p. 706*).—The report here presented includes 26 cases of bovine pulmonary tuberculosis occurring in København (Copenhagen) from February 1931 to July 1933. Ten of the patients were under 5 yr. of age and none over 32 yr. Thirteen of the 26 patients had been drinking raw milk for some time, while only 3 denied they had ever taken raw milk. "In 18 of the 26 cases the tubercle bacilli were cultivated from gastric lavage alone. Sources of error with this method are mentioned and discussed. Six of the patients died within the observation period (concluded in April 1934), and all 6 died of generalized tuberculosis; 3 of them were under 5 yr. of age, 2 between 5 and 15 yr., and 1 over 15 yr. . . . It seems evident . . . that the prognosis of bovine pulmonary tuberculosis in the age-class under 5 yr. is serious, probably just as serious as the prognosis of pulmonary tuberculosis due to the human type of the bacillus."

Family tuberculosis due to bovine tubercle bacilli, A. S. GRIFFITH and W. T. MUNRO (*Brit. Med. Jour., No. 3890 (1935), pp. 147–150*).—Although some 80 human cases of pulmonary tuberculosis due to the bovine type of the organism had been discovered in Great Britain by the close of 1933, no evidence had been obtained of the transmission of the bovine tubercle bacillus from one human to another.

Investigations in 1934, here reported upon, give the details of two families, each of which contained two cases of phthisis pulmonalis in adults and one, in addition, a case of glandular tuberculosis in a child, all due to tubercle bacilli of the bovine type.

Bovine phthisis, its incidence in north-east Scotland, A. S. GRIFFITH and J. SMITH (*Lancet [London], 1935, II, No. 24, pp. 1339–1342*).—Reference is made to the isolation of the bovine type of the tubercle bacillus from 13 of 103 cases of pulmonary tuberculosis in human beings in Scotland.

A peculiar selective site of Bacillus pyogenes in dairy cows, G. MARTINAGLIA (*Jour. So. African Vet. Med. Assoc., 6 (1935), No. 1, pp. 39, 40, fig. 1*).—The author reports having found this organism associated with various suppurations, disease processes, and certain types of mastitis in dairy herds, it being of wide distribution in the Transvaal and of common occurrence in various suppurating processes in dairy cattle. Particular mention is made of its presence in a large induration on the supraposterior aspect of the udder of young heifers shortly before and after calving. It has not been encountered in the milk drawn from the affected udders and appears to be confined to the subcutaneous tissue between the hindquarters of the udder.

A survey of the incidence of Brucella in pasteurized and unpasteurized market milk in Illinois, R. GRAHAM and J. P. TORREY (*Jour. Amer. Vet. Med. Assoc., 88 (1936), No. 5, pp. 614–623, fig. 1*).—During the course of work in Illinois *Brucella* was isolated by guinea pig inoculation from 50 percent of 62 raw milk samples collected at milk depots in 28 widely scattered counties in Illinois. The samples inoculated were taken from vats of pooled milk representing composites of many different cows or herds. The percentage of infection encountered in pooled milk, though seemingly high, may be explained from the fact that contaminated milk is composited with uncontaminated milk upon entering the pasteurizing vat. Milk from a single infected cow may contaminate the entire pool. Pasteurization, as employed in five different types of pasteurizers, effectively destroyed *Brucella* in 31 milk samples. These results suggest the prevalence of *Brucella* in raw pooled milk and the value of pasteurization, as employed in milk depots furnishing samples, in destroying *Brucella*. *B. abortus* is apparently the most prevalent type in raw milk in Illinois.

A list of 25 references to the literature is included.

Kinky tail in cattle, M. W. EMMEL and B. KNAPP, JR. (*Jour. Amer. Vet. Med. Assoc., 88 (1936), No. 5, pp. 630–632, figs. 4*).—The authors' study at the Florida Experiment Station indicates that kinky tail is an inherited character. It is concluded that operation would be advisable only in instances in which the animal is to be used for show purposes.

Mastitis.—III, The identity of Streptococcus agalactiae, P. A. HANSEN (*New York State Sta. Tech. Bul. 232 (1935), pp. 52, pls. 2*).—In continuation of work with mastitis (E. S. R., 68, p. 813), the author reports the results of studies of 94 cultures secured from laboratories that have investigated the cause of ordinary bovine mastitis. These cultures, together with 149 strains freshly isolated from cows infected with bovine streptococcus mastitis, were given comparative study. The results of the studies on the freshly isolated and stock strains of the mastitis streptococcus indicate that the majority of the strepococci associated with ordinary bovine mastitis are of one general type. It is concluded that the preferable name for this streptococcus is *S. agalactiae* Lehm. and Neum. (1896). Its most significant characteristics, which differentiate it from other closely related species of streptococci, are its acid production from maltose, sucrose, and dextrin with no acid production

from mannitol, sorbitol, arabinose, xylose, raffinose, inulin, and amygdalin. It attacks sodium hippurate, does not split esculin, and produces either a viridans or narrow-zone type of hemolysis on blood agar plates. It curdles litmus milk before reduction, reduction progressing afterwards slowly from the bottom upwards. A few strains of a less frequent type *S. uberis* Diernhofer were noted and found to differ from *S. agalactiae* by the fermentation of sorbitol, inulin, and amygdalin, the hydrolysis of esculin, and slow acid production in milk. Action on litmus milk, sodium hippurate, and esculin are recommended as rapid presumptive tests for the differentiation of streptococci isolated from quarter samples.

A seven-page list of references to the literature is included.

Observations on the preventive and curative treatment of bovine pleuropneumonia [trans. title], G. CURASSON (*Bul. Acad. Vét. France, 8 (1935), No. 7, pp. 352–358; abs. in Vet. Rec., 16 (1936), No. 5, p. 112*).—Reference is made to work with formolized vaccine, which has been employed in French West Africa with some success, and to Pirani's modified formolized vaccine, which failed to protect. Mixtures of the virus and saponin gave very promising results, and it is concluded that if his results are confirmed this method will prove to be the simplest and most effective. Novarsenobenzol, although of little use in peracute and massive infections, is considered to be a specific remedy and to be the best therapeutic agent available for this disease.

The role of Trichomonas in abortion, pyometra, and sterility of the cow, M. BOURDIÉ (*Rec. Méd Vét., 112 (1936), No. 2, pp. 93–100, figs. 2*).—*Trichomonas* was found by the author to be present in 9 of 27 cases of pyometra and absent in the uteri of 30 normal cows systematically examined.

An acanthocephalid parasitic in a calf, J. H. WHITLOCK and C. C. MORRILL (*Jour. Amer. Vet. Med. Assoc., 88 (1936), No. 6, pp. 764–766, fig. 1*).—The infestation of a calf received from the vicinity of Riley, Kans., by the thorn-headed worm of swine (*Macracanthorhynchus hirudinaceus*), here reported, is said to be the first record of a natural infestation of a bovine by it.

The effect of splenectomy on anaplasmosis of the sheep [trans. title], F. LESTOQUARD, A. DONATIEN, and C. SALORD (*Bul. Soc. Path. Exot., 29 (1936), No. 3, pp. 264–266*).—The effect of splenectomy is said to vary with the several blood parasites. With the Piroplasmidae, including *Piroplasma* sens. strict., *Babesiella*, and *Nuttalia*, the nonpathogenic *Theileria*, including *T. mutans* and *T. recondita*, and *Bartonella* and *Eperythrozoon*, it is followed by a temporary suspension of the premunition. In the case of the Anaplasmidae splenectomy causes a definite suppression of premunition, at least where *Anaplasma ovis* is involved. In the case of the pathogenic *Theileria*, including *T. parva* and *T. dispar*, splenectomy does not have any effect upon premunition.

The sheep nasal fly: A method of treatment for sheep infected with larvae of Oestrus ovis, R. DU TOIT and R. CLARK (*Jour. So. African Vet. Med. Assoc., 6 (1935), No. 1, pp. 25–32, figs. 2*).—A treatment which consists of an injection into each frontal sinus of 2 cc of a mixture of equal parts of carbon disulfide and liquid paraffin has been found to be safe, practicable, and efficacious when carried out in the proper way and on suitable subjects. It is not safe for sheep under 6 mo. of age.

Parasites and parasitic diseases of swine in Puerto Rico, H. L. VAN VOLKENBERG (*Puerto Rico Sta. Bul. 38 (1936), pp. 14, figs. 2*).—This contribution considers the occurrence and distribution of the parasites of swine common in Puerto Rico, the damage caused, need for shade protection, preventive measures, the bare-lot method of raising hogs, and treatment. Summarized accounts of the ecto- and endo-parasites of importance follow.

Anaplasmosis-like disease in Formosan swine, M. SUGIMOTO (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaishi), 7 (1935), No. 3, pp. 240–244, figs. 3*).—This contribution in Japanese, presented with a list of 15 references to the literature, describes a new species of *Anaplasma* found in swine in Taiwan under the name *A. taiwanensis.*

Intestinal emphysema in swine, H. E. BIESTER, D. F. EVELETH, and Y. YAMASHIRO (*Jour. Amer. Vet. Med. Assoc., 88 (1936), No. 6, pp. 714–731, figs. 7*).—In experiments with swine conducted in Iowa, intestinal emphysema was found associated with feeding polished rice. "The kind of protein supplement did not affect its appearance when rice was fed. When corn was fed with as much as 20 percent skim milk powder by dry weight, emphysema failed to develop. The process consists of a gaseous distention of the lymph spaces involving the intestinal mucosa, submucosa, inner and outer muscle layers, serosa, mesentery, and the lymph nodes draining the affected portion. The process usually involves the entire jejunum, part of the ileum, and in some cases the terminal portion of the duodenum. In one instance cysts were found on the rectal serosa and the adductor muscles near the symphysis pubis. Vitamin B did not appear to be a factor. Bacteriologic examinations were negative. No significant hematologic deviations were associated with intestinal emphysema. Two cases of intestinal emphysema were encountered in several groups of chickens on a test ration containing rice. The blood chemistry of the swine was normal as far as it was investigated."

Epithelial diverticula in the large intestine of swine, H. C. H. KERNKAMP (*Jour. Amer. Vet. Med. Assoc., 88 (1936), No. 6, pp. 732–736, figs. 3*).—Contributing from the Minnesota Experiment Station, an account is given of a histological study of the small nodular bodies of macroscopic dimensions observed during the past 15 or 20 yr. in the walls of the large intestine of swine. Previously assumed to have been produced by a nematode of the genus *Oesophagostomum,* the examination has shown the lesions to represent outpocketings of the epithelium, surrounded to a greater or less extent by lymphoid tissue. The origin of the epithelial diverticula appears to relate to the embryonal development of the pig. It is pointed out that in many of the diverticula studied, a process of necrosis was taking place which involved the epithelial structures. A liquefaction of the cryptic contents was also noted. The importance of the lesion, insofar as it relates to the well-being of the animals in which it occurs, is not definitely known at present.

Tuberculosis in a herd of hogs with one hundred per cent mortality, J. F. BULLARD (*Jour. Amer. Vet. Med. Assoc., 88 (1936), No. 5, pp. 632–636*).—Contributing from the Indiana Experiment Station, the author reports upon an outbreak of tuberculosis in a herd of 12 sows and 68 pigs in which there was a 100-percent death rate from September to April. Autopsies were made on two field cases of this outbreak, and in each instance acid-fast organisms and tubercles were demonstrated in the various sections prepared for microscopic examination.

Animal inoculations for typing purposes, although not entirely complete, were carried out. Acid-fast organisms and tubercles were demonstrated in a rabbit that had been inoculated subcutaneously with tissue from one of the field cases. A lung emulsion, prepared from this rabbit, was injected into a pig, hen, guinea pig, and rabbit. In 15 and 13 days, respectively, the pig and guinea pig died, and each showed lesions of tuberculosis and acid-fast organisms also were found. The results of these inoculation experiments demonstrated that an acid-fast organism, apparently of the bovine type, was the

causative factor." The possibility of *Actinomyces necrophorus* playing any particular part in the outbreak was eliminated through inoculation experiments.

Encephalitis in horses, L. P. DOYLE (*Jour. Amer. Vet. Med. Assoc., 88 (1936), No. 5, pp. 636–641, figs. 6*).—In studies at the Indiana Experiment Station an encephalopathic disease prevalent in horses in parts of the State during the fall and winter of 1934 and 1935 is reported upon. While the precise nature of this horse disease was not fully determined, the type of microscopic change found, particularly the perivascular accumulations of cells, indicates an infectious agent as the cause. The relationship between this disease and encephalomyelitis remains to be determined.

Observations on complement-fixation with distilled water-spleen antigen in equine infectious anemia, W. M. MOHLER (*Jour. Amer. Vet. Med. Assoc., 88 (1936), No. 5, pp. 624–627*).—In this preliminary account it is pointed out that while the complement-fixation test for infectious anemia of horses (swamp fever) is still in the experimental stage, the results thus far obtained have been encouraging and are presented with the view to furthering similar diagnostic investigations of other research workers.

Horsesickness, R. A. ALEXANDER and B. VAN DER VYVER (*Jour. So. African Vet. Med. Assoc., 6 (1935), No. 1, pp. 33–38*).—During the season of 1933–34 a total of 171 horses and 28 mules were immunized under field conditions against horsesickness by means of neurotropic attenuated virus. Immunization was effected by the injection of either a single strain of virus, by successive injections of two strains, or by a single injection of a mixture of two strains. The total number of deaths following vaccination was 3, but since the animals in question died not later than the fifth day, it is believed that death was due not to the injection but to natural infection prior to immunization. This opinion is discussed. The number of breakdowns in immunity was 29; of these 2 recovered and 27 died.

Extent of vertical migration of horse strongyle larvae in soils of different types, J. T. LUCKER (*Jour. Agr. Res. [U. S.], 52 (1936), No. 5, pp. 353–361*).—In experimental work aimed at determination of the extent to which vertical migration of horse strongyle larvae in soils may occur, such information being closely related to the value of plowing under as a control means for horse strongyles, a number of infective larvae were buried, usually from 1 to 6 in. beneath the surface. They were placed in helminthologically sterile or tested larva-free clay, heavy sandy loam to clay loam, sandy clay loam, sandy loam, sandy light clay loam, and coarse sand soils. The special wooden boxes usually used as containers were kept either in the laboratory, under shelter, or outdoors. In experiments in the laboratory or under shelter, the soil was kept moist; precipitation invariably occurred during the outdoor experiments. The larvae reaching the surface in from 19 to 67 days after burial were isolated in the Baermann apparatus, counted, and their number calculated in terms of percentage of the number of larvae originally buried.

In clay soils few or no larvae were recovered at the surface; in the other soils a maximum of 1.9 percent of the larvae buried from 3 to 6 in. were recovered at the surface after from 25 to 62 days. From shallower depths the percentages of larvae reaching the surface in similar intervals were markedly higher. When feces containing an undetermined large number of infective larvae were buried from 3 to 8 in. in coarse sand, 6,920 larvae reached the surface after 28 days from a depth of 8 in. Some simultaneous lateral migration occurs during upward migration.

Assuming constancy of the rates of vertical migration shown by the experiments, it is concluded that deep plowing of infested pastures should be of some value for the control of strongyle parasitism in horses; the effectiveness of this control measure will be affected by the depth of the burial of the larvae and the type of soil in which they are present.

Diseases and parasites of poultry in California, J. R. BEACH and S. B. FREEBORN (*Calif. Agr. Col. Ext. Circ. 8, rev. (1936), pp. 110, figs. 44*).—The present status of knowledge of the important diseases and parasites of poultry as met with in California is here brought together for use by the poultryman.

[Report of work in avian pathology by the New Hampshire Station] (*New Hampshire Sta. Bul. 289 (1936), pp. 16, 24–26, 27*).—The work of the year briefly referred to includes studies of the ruptured egg yolk in the domestic fowl, by L. W. Slanetz; skin vaccination for fowl pox, and poultry autopsies, both by C. L. Martin and C. A. Bottorff; and pullorum testing, and studies in the improvement of technic for the eradication of pullorum disease, both by Bottorff.

Studies on the egg-propagated viruses of infectious laryngotracheitis and fowl-pox, C. A. BRANDLY (*Jour. Amer. Vet. Med. Assoc., 88 (1936), No. 5, pp. 587–599*).—Studies conducted at the Kansas Experiment Station have shown that the viruses of infectious laryngotracheitis and of fowl pox may be carried through an indefinite series of developing egg passages by the methods here described, the incidence of extraneous bacterial contaminations having been materially lower than by methods heretofore described.

"Infectious laryngotracheitis virus (strain 8090), propagated through 35 series of developing chicken eggs, did not show significant modifications in virulence. The egg-propagated virus appeared equally as satisfactory as fresh tracheal exudate virus when used for protective vaccination against the disease. Fowl pox virus passed through 8 series of chicken eggs did not appear to be altered significantly in virulence for developing eggs or chickens of several ages. The chorioallantoic-cultivated pox virus used in vaccination gave satisfactory 'takes' and immunity as compared to the comb-lesion virus from nearly mature chickens. Of the species of developing eggs, other than chickens, only those of the turkey were susceptible to infectious laryngotracheitis infection. By the methods employed, negative results were obtained with pigeon, guinea fowl, and duck eggs."

A list is given of 16 references to the literature.

Lymphocytoma and fowl paralysis, R. FENSTERMACHER (*Jour. Amer. Vet. Med. Assoc., 88 (1936), No. 5, pp. 600–613*).—In a study at the Minnesota Experiment Station of a fatal neoplastic-like disease of the domestic fowl, in which the pathological lesions are confined to the visceral organs and the skeletal muscles, and for which the term "lymphocytoma" has been selected as a designation by the author, 715 chicks were hatched during a 2-yr. period. The losses due to intercurrent diseases were tremendous, 58 percent of the chicks hatched during the first year and 70 percent of those hatched during the second year having succumbed as a result of diseases other than those under investigation. The term "fowl paralysis" is restricted to the condition in which the pathological lesions are confined to the eyes, nerve, and brain tissues. The data presented, the details of which are given in six tables, support the view that lymphocytoma and fowl paralysis are two separate diseases, the latter being transmissible while the former is nontransmissible. Furthermore, the two diseases may coexist in the same bird. The data suggest that heredity is a factor to be considered in the transmission of the two diseases.

A list is given of 12 references to the literature.

The etiology of fowl paralysis, leukemia, and allied conditions in animals, III, IV, M. W. EMMEL (*Florida Sta. Bul. 293 (1936), pp. 23*).—The third and fourth parts of this contribution (E. S. R., 74, p. 262) are presented.

III. *The intestinal flora of chickens affected with enteritis associated with intestinal parasitism* (pp. 5–17).—The species "*Salmonella aertrycke* was found in the intestinal contents of five birds affected with enteritis associated with coccidiosis, *S. enteritidis* in three birds, *S. typhimurium* in two birds, while *S. schottmulleri*, *S. suipestifer*, *S. pullorum*, [and] *Eberthella typhi* were found in the intestinal contents of but one bird each. Five birds did not yield cultures of paratyphoid or typhoid organisms. The percentage occurrence of these micro-organisms ranged from 8.7 to 61.4 percent of the total bacterial flora. In 18 birds affected with enteritis associated with roundworms, tapeworms, or both, *S. aertrycke* was isolated from the intestinal contents of four birds, *S. typhimurium* from two birds, while *S. enteritidis*, *S. paratyphi*, *Shigella paradysenteriae*, *E. typhi*, and *E. enterica* were isolated from the intestinal contents of but one bird each. The percentage occurrence of these micro-organisms ranged from 25.8 to 58.6 percent of the total bacterial flora. In a routine examination of selected cases eight species of *Salmonella*, one species of *Eberthella* and *Shigella*, seven unidentified cultures of *Salmonella*, and four unidentified species of *Eberthella* were isolated from 137 to 230 samples of intestinal contents of birds affected with enteritis associated with *Eimeria*, *Ascaridia*, *Capillaria*, and *Taenia*. *S. aertrycke* was the predominating organism isolated. *E*[*berthella*] *typhi* was isolated from two birds." The author was led to conclude that intestinal parasitism seriously interferes with the normal flora, allowing micro-organisms of the paratyphoid and typhoid groups to become established in the intestinal tract. It is pointed out that chickens offer a vast potential source of micro-organisms of the paratyphoid and typhoid groups, which opens a broad field for the epidemiologist interested in the relation of these micro-organisms to human health.

IV. *The pathologic manifestations of the causal micro-organisms in the fowl* (pp. 18–23).—It is concluded that all of the pathologic manifestations here described may occur independently of each other. Since most of them are caused by the same inciting agent, in many cases several manifestations, such as "light" and anemia, neurolymphomatosis and lymphomatosis, neurolymphomatosis, and the various types of leukemia, may occur in the same bird. It is pointed out that in some cases of erythroleucosis and lymphomatosis a correct diagnosis can be made only upon histopathological study of the affected tissues. Some birds which do not present symptoms of fowl paralysis show microscopic infiltrations of nerve tissue, but these are not numerous.

The unity of the viruses of leucosis and sarcomatosis of the fowl [trans. title], J. TROISIER and J. SIFFERLEN (*Ann. Inst. Pasteur, 55 (1935), No. 5, pp. 501–517, figs. 6*).—Inoculation experiments indicate that fowl leucosis and sarcomatosis are produced by a single virus.

The isolation of a hemophilic bacillus in pure culture and the reaction of chickens to extranasal inoculations thereof, J. P. DELAPLANE, L. E. EDWIN, and H. O. STUART (*Jour. Agr. Res. [U. S.], 52 (1936), No. 5, pp. 377–383*).—Two phases of a study of hemophilic bacilli conducted at the Rhode Island Experiment Station are reported upon, namely, a technic for isolating *Hemophilus gallinarum* in pure culture, and the reaction of chickens to the extranasal inoculations thereof.

It has been found that *H. gallinarum* may be readily isolated in pure culture from the edematous swellings of fowls showing an infectious coryza, and that the success of the isolation depends on the length of time the swellings have

persisted. It is accomplished by inoculation of sterile chicken blood in a 2-percent sodium citrate solution at the base of nutrient agar slants, preferably within 24 hr. after the swellings have appeared. After 48 hr. there is less chance of obtaining the organism. Since the duration of time the infection has persisted in field cases is usually unknown, it is suggested that for diagnostic purposes susceptible fowls be inoculated intranasally with the infective material and cultures made from them within 24 hr. after the facial swellings are noted. This technic serves as an aid in the differentiation of certain other respiratory infections of fowls in which a coryza is a symptom, particularly that type characterized by a marked rattled breathing and lesions of an acute bronchitis and tracheitis with which a coryza is noted and which may also show some swelling around the eye. The subcutaneous, intraperitoneal, and wattle injections of 24-hr. cultures of *H. gallinarum* failed to stimulate any appreciable immunity, although it was evident that intranasal infection occurred from such inoculations.

"The cloacal inoculation of the cultured organisms combined with laryngotracheitis virus did not result in any upper respiratory infection in a group of five chickens. The chickens were later found to be resistant to laryngotracheitis virus, but susceptible to intranasal inoculations of cultured organisms. The fact that the preliminary group was resistant to intranasal reinoculations remains unexplained."

A comparison of the tube, rapid serum, and rapid blood drop agglutination tests for the detection of carriers of Salmonella pullorum, G. R. SIPE and H. D. POLK (*Mississippi Sta. Bul. 306 (1935), pp. 9, figs. 4*).—Following a review of the subject, presented with a list of 19 references to the literature, experimental work is reported upon.

Comparative tests of the rapid blood drop, rapid serum, and tube methods were found to give very slight variations between the total average positive and negative reactions. There were 31 individual variations between the results of the rapid blood drop and tube, 31 between the rapid serum and tube, and 24 between the rapid blood drop and rapid serum methods. Colored antigen gave a much more conclusive or positive test than clear antigen. The rapid blood drop method was found to be practical and efficient under field conditions and was more economical in time, labor, and money than the tube or rapid serum tests. The rapid blood drop method when applied to the station flock detected five reactors on the first test and no reactors on the second test 6 weeks later. The mortality of chicks from these flocks has been 5 percent with no indications of white diarrhea. In view of the fact that the rapid blood drop method was found to be practical, efficient, and economical, it appears that this method should be given recognition by being placed on a parity with the tube and rapid serum methods, and that it might be recommended to poultry breeders as a reliable, practical method.

The use of pigeon pox virus against fowl pox [trans. title], J. BASSET (*Rev. Vét. [Toulouse], 87 (1935), Oct., pp. 553–559, pl. 1*).—In considering pathogenicity, it is pointed out that even the young of galliform fowl when inoculated with large doses of the pigeon pox virus recover in 2 weeks, while a light form of fowl pox lasts twice that time. It was found that although a small dose of fowl pox virus—very pathogenic for gallines—is sufficient to confer an absolute immunity for a long period of time, 20 times as large a dose of the pigeon pox virus—but slightly pathogenic for gallines—induces only a partial immunity. The work with fowl pox and pigeon pox viruses has shown that the immunity conferred is in direct proportion to the pathogenicity and the dose of the virus employed.

The effect of certain dressings on worm-infested poultry runs, H. F. NEWBIGIN and D. O. MORGAN (*Scot. Jour. Agr., 19 (1936), No. 2, pp. 162–166*).—The experiment reported, in which infested plats 36 × 30 ft. square were treated with (1) agricultural salt 600 lb., (2) ground lime 200 lb., (3) sulfate of ammonia 200 lb., and (4) 50 gal. of 1¾-percent solution of sulfuric acid, respectively, has shown that these treatments are not effective against the eggs of nematodes. It has also shown that heavy infestations with *Heterakis gallinae* and *Capillaria* spp. can take place from runs that have been rested for 8 mo.

Salmonella isolated from baby quail, R. GRAHAM (*Jour. Amer. Vet. Med. Assoc., 88 (1936), No. 6, pp. 763, 764*).—A study of the high mortality in baby quail experienced during the summer of 1935 at one of the Illinois State game farms resulted in the isolation of a *Salmonella* organism which possesses cultural characteristics resembling *S. newport* and, serologically, possesses a group relation to *S. newport*. In this outbreak baby quail that appeared healthy in the evening were found dead the following morning. In some brooders the mortality was as high as 75 percent, and it was estimated that 60 percent of all quail hatched succumbed.

AGRICULTURAL ENGINEERING

The engineering reorganization of farms, N. A. KESSLER (*Agr. Engin., 17 (1936), No. 4, pp. 153, 154, fig. 1*).—This is essentially a brief progress report of studies being conducted by the U. S. D. A. Bureau of Agricultural Engineering in the subject.

[Agricultural engineering investigations by the Massachusetts Station], C. I. GUNNESS, L. A. BRADLEY, J. B. BELKNAP, and C. F. CLANCY (*Massachusetts Sta. Bul. 327 (1936), pp. 8, 9, 22*).—The progress results are briefly presented of investigations on apple storages and stream pollution by private and municipal raw sewage.

[Agricultural engineering investigations by the New Hampshire Station], W. T. ACKERMAN, H. C. MOORE, G. M. FOULKROD, T. B. CHARLES, A. E. TEPPER, F. D. REED, and K. W. WOODWARD (*New Hampshire Sta. Bul. 289 (1936), pp. 20–24*).—The progress results are briefly presented of a rural electrification survey in New Hampshire and of investigations on precooling of milk, heat requirements for brooding chicks, pneumatic tractor equipment, and fence post durability.

[Agricultural engineering investigations by the North Dakota Station], H. F. MCCOLLY (*North Dakota Sta. Bul. 286 (1935), pp. 60–62*).—The progress results are briefly presented of investigations on the ice well and kerosene-burning mechanical refrigerators, and temporary silos.

Surface water supply of the United States, 1934, Parts 5, 6, 9 (*U. S. Geol. Survey, Water-Supply Papers 760 (1936), pp. VIII+250, fig. 1; 761 (1935), pp. IX+340, fig. 1; 764 (1936), pp. VI+151, fig. 1*).—These papers present the results of measurements of flow made on streams during the year ended September 30, 1934, No. 760 covering the Hudson Bay and upper Mississippi River Basins, No. 761 the Missouri River Basin, and No. 764 the Colorado River Basin.

The Thiem method for determining permeability of water-bearing materials and its application to the determination of specific yield, L. K. WENZEL (*U. S. Geol. Survey, Water-Supply Paper 679–A (1936), pp. IV+57, pls. 6, figs. 7*).—This report was prepared in cooperation with the University of Nebraska.

The Thiem method for determining permeability of water-bearing materials consists of pumping a well, or, where the ground water is confined under pressure, allowing the well to flow and observing the decline of the water table or piezometric surface in nearby observation wells. The coefficient of permeability is computed by the formula

$$P=\frac{527.7\,q\log_{10}\frac{a_1}{a}}{m\,(s-s_1)}$$

where P is the coefficient of permeability, q the rate of pumping in gallons a minute, a and a_1 respective distances of two observation wells from the pumped well in feet, m for artesian conditions the vertical thickness of the water-bearing bed in feet, m for water-table conditions the average vertical thickness at a_1 and a of the saturated part of the water-bearing bed in feet, and s and s_1 the draw-downs at the two observation wells in feet. This formula is mathematically developed by assuming ideal geologic and ground water conditions, such as a uniform permeability, a uniform thickness of water-bearing bed, a horizontal water table or piezometric surface, and a cone of depression that has reached equilibrium in form. As these conditions are rarely approached, the applicability of the formula and hence of the method has been regarded as questionable.

Two rather elaborate pumping tests were made in 1931 near Grand Island, Nebr., in which the behavior of the ground water was observed over a large area around the pumped wells by measuring the fluctuation of the water table in 81 observation wells during the period of pumping and after pumping was stopped. A study of the data obtained from these tests indicates that the Thiem method is applicable to conditions that are found in nature, but to obtain consistent and accurate determinations of permeability it is necessary to employ an arbitrary procedure in computing the coefficient. The draw-down of the water table at any distance from the discharging well should be taken as the average of the draw-down at that distance up-gradient and down-gradient from the well. In the first test described in this report the cone of depression reached approximate equilibrium in form out to about 200 ft. from the pumped well after 48 hr. of pumping and was affected by irregular conditions near the well as far as 40 ft. from the well. Hence the draw-downs that were used for computations of permeability were selected from that part of the cone between 40 to 200 ft. from the pumped well. In the second test pumping was stopped several times and the cone of depression did not reach approximate equilibrium in form.

Computations were made to determine the specific yield of the water-bearing materials from the data obtained in the pumping tests. The results show that the specific yield can be readily determined by this method. Samples of the material were analyzed in the laboratory for specific yield, and the results obtained compared favorably with those determined by the pumping method.

Readjusting Montana's agriculture.—VI, Montana's irrigation resources, P. L. SLAGSVOLD (*Montana Sta. Bul. 315 (1936), pp. 18, figs. 4*).—This bulletin presents an inventory and analysis of the irrigation water resources of Montana in relation to agricultural adjustment in the State. It is pointed out that at present the irrigated area embraces about 2,000,000 acres of land scattered throughout the entire State. Much of this land is watered from seepage or from occasional floods, which makes it suitable only for hay. A large proportion of the remainder is subject to periodic or occasional water shortage, which prevents development of intensive farming. Without supplementary storage,

much of the land cannot be put to its best use. The available water in readily accessible streams has been appropriated by private users or companies. In many cases these rights to water are distributed in such a way as to cause a wasteful and often detrimental use. Some areas could solve their water problem best by pooling the rights and making a complete change in the distribution system. Other areas need storage.

Where large irrigation works have to be constructed, either for new or supplemental development, the problems of costs, returns, and financing are significant, as are also the questions of the best method of assessing the costs in accordance with benefits received. Montana at present has no law which provides for spreading the burden of irrigation developments over the entire community.

The belief is expressed that much of the irrigation development in Montana in the next few years probably will take the form of greater intensification in the use of existing irrigated land, either through the development of supplemental water on major irrigation projects, reviving defunct irrigation districts and companies, or more intensive agriculture on a few large irrigated stock ranches.

Farm irrigation pumping plants, A. S. CURRY (*New Mexico Sta. Bul. 237 (1936), pp. 44, figs. 21*).—Technical information of a generally practical character is presented on the development and sinking of wells for farming irrigation pumping and the selection and installation of pumping plants and necessary equipment. An appendix gives the text of the New Mexico law relating to underground water.

The Parshall measuring flume, R. L. PARSHALL (*Colorado Sta. Bul. 423 (1936), pp. 84, figs. 30*).—A description is given of this flume, together with the results of laboratory and service tests and tabular discharge data.

The Parshall measuring flume has shown in field operation that it is practical under conditions which make a standard weir or rating flume impractical, either because of silting trouble or insufficient grade. As to the accuracy of measurement with this device, the observed discharge, free flow, was within 3 percent of the computed amount in 89 percent of the tests, while for the submerged flow, 85 percent of the observed discharges were within 5 percent of the computed amounts. The range of capacity of discharge from a minimum of less than 0.1 sec.-ft. through the 3-in. flume to a maximum of 1,500 sec.-ft. through the 40-ft. flume, as limited by present investigations, is sufficient to meet ordinary requirements. This device operates successfully with relatively small loss of head, and for free flow this loss in a standard weir is approximately four times that in the flume. The flume will withstand a high degree of submergence without affecting the rate of free-flow discharge, and for this reason it is recommended that the throat-gage stilling well be provided to obtain the full efficiency of the flume. Because of the increased velocity of the water it will operate successfully in sand- or silt-laden streams. Since the floor of the structure is constantly swept clean of all deposit, constancy of condition is maintained.

Operation is simple because it has no adjustable or moving parts. Its dimensions are not easily altered so as to cause wilfully unfair measurement of the discharge. The filling of the weir box upstream from the crest, by natural deposit from the stream, causes the weir to over-register, and consequently there is no incentive on the part of the water user to correct this condition. Discharge through rating flumes may be changed to the advantage of the user by altering downstream conditions. Velocity of approach of the stream to the entrance of this device has little or no effect upon the rate of

discharge. Plane surfaces in the structure make it easy to construct. For moderately large flows the upper ends of the converging section should be rounded off by means of sheet metal pieces rolled to a radius of 4 or 5 ft. The structure may be built of wood, concrete, or sheet metal. Precast concrete members may be made and assembled in the field for the small-sized flumes. Sheet metal flumes, portable because of their light weight, are entirely practical for the small sizes.

Recording instruments may be operated in connection with this device to register heads or total discharge. Where the degree of submergence exceeds about 95 percent, the indicated discharge through the flume is not wholly dependable. If conditions permit, the discharge should be free flow or with the least possible degree of submergence. For free flow, the flume's measurement of discharge depends upon a single head or depth only, it being similar in this respect to a standard weir or rating flume. The upper head in the converging section, or the throat head, may be read on either side of the flume with equal accuracy. Scales or gages attached to the inside of the flume for the purpose of determining the head are not recommended except for small flows or moderate depth and free-flow condition. Better results are obtained if the heads are observed in stilling wells outside the structure. For free flow the exit velocity is relatively high, and bottom as well as bank protection must be provided to prevent erosion. Where the materials are of such a nature as to withstand a high velocity, such as heavy gravel or rock, no attention need be given to protection.

The Parshall measuring flume has the advantage over the old type of Venturi flume in that the angles of convergence and divergence are such as to eliminate the effect of the switching of the current in the diverging section, which, in the old flume, affected the discharge.

Public Roads, [April, May, and June 1936], (*U. S. Dept. Agr., Public Roads, 17 (1936), Nos. 2, pp. 21–43+[1], figs. 21; 3, pp. 45–68+[1], figs. 23; 4, pp. 69–88+[2], figs. 17*).—These numbers of this periodical contain data on the status of the various highway projects, receiving Federal funds, as of March 31, April 30, and May 31, 1936, respectively, and the following articles:

No. 2.—The New Hampshire Financial Survey, by E. Church (pp. 21–37, 40), and Dimensions of Testing Equipment Affect Hubbard-Field Stability Values, by J. T. Pauls (pp. 38–40).

No. 3.—Stabilized Soil Roads, by C. A. Hogentogler and E. A. Willis (pp. 45–65).

No. 4.—Circular Track Tests on Low-Cost Bituminous Mixtures, by C. A. Carpenter and J. F. Goode (pp. 69–82), and Indexes of Highway Construction Costs (pp. 83–85).

Loaded spoked vehicle wheels, J. B. Reynolds and F. L. Ehasz (*Agr. Engin., 17 (1936), No. 4, pp. 155–161, figs. 5*).—In this contribution from Lehigh University the fundamental formulas upon which the analysis of loaded spoked wheels is based are presented, together with an exposition of the manner of their use.

Additional formulas for rim, spoke, and center deflections applicable for the two critical positions are derived. Detailed applications of the general theory to a 4- and 6-spoked wheel for the first position have been worked out, and the former are presented. The method for any number of spokes is outlined. Simplified solutions for both critical positions are given for 4 and 6 spokes and indicated for any number. Finally, experimental checks on the theory made by the photoelastic method are presented.

The mathematical theory of elasticity is utilized in developing general and simplified methods of analysis for vehicular wheels with an even number of

spokes. Critical rim and spoke moments are developed with the two lowest spokes of the wheel assuming an equal angle with the vertical. When two spokes are vertical, the lower spoke takes over 90 percent of the load. It is desirable, therefore, to design spokes so that they will carry the entire load in this position. Contrary to the opinion of a former investigator, both the analytical and photoelastic results confirm the fact that the two lower spokes of the 4-spoked wheel, with spokes at 45°, develop higher stresses than the upper spokes. The upper half of the 6-spoked wheel in both critical positions had relatively small stresses. Although there was some lack of agreement between the analytical and experimental results, the critical conditions which are most important from the practical viewpoint were approximately similar, with the analytical solution practically always on the safer side.

It is felt that the graphical method of analyzing stresses in this problem leads to erroneous results. The present investigation takes into account the elasticity of straight and curved rods, and as a consequence approaches actual stress conditions more closely.

A nursery thresher for sorghum heads, R. O. SNILLING (*Jour. Amer. Soc. Agron., 28 (1936), No. 3, pp. 253, 254, fig. 1*).—A nursery thresher particularly adapted to individual heads of sorghum, constructed at the U. S. D. A. Dry Land Field Station, Lawton, Okla., is described and illustrated.

The vertical drier for seed cotton, C. A. BENNETT and F. L. GERDES (*U. S. Dept. Agr., Misc. Pub. 239 (1936), pp. 22, figs. 16*).—This publication supersedes Miscellaneous Publication 149 (E. S. R., 68, p. 106). It describes the vertical drier for seed cotton developed by the Bureau of Agricultural Engineering for carrying out the Government process of artificially drying seed cotton.

In this drier the drying chamber contains no moving parts, and the seed cotton is carried through it by the blast of drying air. Because of the simplicity of this design it is more economical to construct and to operate than the earlier types. Moreover, to an appreciable degree this type automatically adjusts the period of exposure in the drying chamber to the degree of dampness of the cotton, because that which has little moisture moves through the chamber more quickly than that which has much moisture. This drier has proved satisfactory in actual service under wide variations in conditions.

Very wet cotton can be dried by passing it through the drier a second time. The apparatus will condition seed cotton for ginning in any kind of weather, provided the dried cotton is conveyed from the drier directly to the gins in the heated air.

Information on installation and operation is included.

Burr mill design and performance, H. D. BRUHN (*Agr. Engin., 17 (1936), No. 3, pp. 101–107, figs. 18*).—Studies conducted at the Wisconsin Experiment Station are reported, the purpose of which was to determine some of the fundamental principles involved in the design and performance of the burr type feed mill and the relation of the numerous factors to each other. Data from over 600 tests conducted over a period of 3 yr. are summarized.

It was found that to obtain high grinding efficiency in the small burr type mills, the speed must be high and the rate of feeding must be regulated to eliminate crowding of the burrs. Therefore it is necessary that the mill be equipped with a feeding device which will continue to feed the mill uniformly at any desired rate.

When high speeds are used it is necessary to use rigid burr mountings, good bearings (preferably antifriction), and fixed burr clearance to eliminate vibration and to prolong the life of the burrs and the mill. It is also essential that the mill be equipped with a safety release to obviate damage due to foreign material in the grain.

The permissible rate of feeding the mill is almost directly proportional to the speed. Therefore, when the most efficient rate of grinding at any speed is found for a particular burr, it is possible to predict very closely the most desirable rate of grinding for any other speed or to predict the proper speed for any other rate of grinding desired.

A burr mill, if operated at fairly constant speed and rate of feeding, will grind to nearly the same fineness modulus for a long period of time at a given burr clearance. Burr design is a very important factor in the performance of a mill. It has been demonstrated that in the small size the burr mill will perform equally as well as the hammer mill.

New Jersey laying houses, E. R. GROSS (*New Jersey Stas. Hints to Poultrymen, 23 (1936), No. 4, pp. 4*).—Practical information is given on poultry house planning and construction for New Jersey conditions, including data on lighting, wall and floor construction, insulation, and ventilation.

AGRICULTURAL ECONOMICS

[Papers presented at the twenty-sixth annual meeting of the American Farm Economic Association] (*Jour. Farm Econ., 18 (1936), No. 2, pp. 229–420, figs. 2*).—Papers with discussions thereon, in addition to those previously noted (E. S. R., 75, p. 268), are included as follows: The Agricultural Adjustment Act and National Recovery, by C. C. Davis, with discussion by J. D. Black (pp. 229–243); Fundamental Significance of the Agricultural Adjustment Concept, by E. G. Nourse, with discussion by J. I. Falconer (pp. 244–256); The Social and Economic Implications of the National Land Program, by L. C. Gray, with discussion by N. Clark(pp. 257–280); A Future Pattern of Research in Agricultural Economics, by E. Englund, with discussion by F. F. Hill (pp. 281–295); Research in Agricultural Economics From the Standpoint of the States, by T. W. Schultz, with discussion by F. P. Weaver (pp. 296–310); Agricultural Policy and the Economist, by A. G. Black (pp. 311–319); A Classification and Summary of Research Projects in Dairy Marketing, by S. C. Hudson (pp. 320–329); Research in the Consumption and Demand for Milk, by W. C. Waite (pp. 330–337); Research in Costs of Distributing Milk, by L. Spencer (pp. 338–351); Transportation of Milk in the St. Louis Milkshed, by R. W. Bartlett (pp. 352–362); Marketing Research Needs of the Dairy Industry, by H. A. Ross (pp. 363–368); Research in Marketing Fruits and Vegetables, by N. L. Allen (pp. 369–371); The Motor Truck in Relation to Fruit and Vegetable Marketing, by M. P. Rasmussen, with discussion by H. H. Bakken (pp. 372–387); New York Foods Consumption Survey, by A. Sturges, with discussion by E. R. French (pp. 388–392); Research as a Basis for Grading Fruits and Vegetables, by C. W. Hauck, with discussion by W. G. Meal (pp. 393–404); and Urgent Needs for Research in Marketing Fruits and Vegetables, by F. V. Waugh, with discussion by W. C. Hopper (pp. 405–420).

[Notes on agricultural economics] (*Jour. Farm Econ., 18 (1936), No. 2, pp. 421–430*).—Included are California Agricultural Prorate Act Constitutional, by E. A. Stokdyk; Can Counties be Reorganized—Consolidated?, by H. L. Euler; Results of the Czechoslovakian Land Reform, by S. Borodaewsky; and Developments Affecting the International Trade of the United States in Agricultural Products, by J. D. Black.

[Investigations in agricultural economics by the Massachusetts Station, 1935] (*Massachusetts Sta. Bul. 327 (1936), pp. 5–8*).—Included are (1) a brief summarization of conditions as to rural real estate tax delinquency, tax sales, redemption, etc., during the period 1928–32, found by R. L. Mighell in a study

made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., and (2) a few facts as to municipal control of milk in New Zealand and two small areas in the United States, found by Mighell in a study of milk as a municipal utility.

[Investigations in agricultural economics by the New Hampshire Station, 1935] (*New Hampshire Sta. Bul. 289 (1936), pp. 8–10*).—Included are (1) a table showing the receipts from agricultural products, forest products, outside work, and pensions, gifts, etc., on 255 southern Grafton County farms, as found in a study of land utilization by H. C. Woodworth and M. F. Abell; (2) data by L. A. Dougherty as to grading percentages on over 11,000 cases of large brown eggs handled by the New Hampshire Auction during its first year; and (3) some results of the type of farming area study made in cooperation with the U. S. D. A. Agricultural Adjustment Administration by H. C. Grinnell, Woodworth, E. H. Rinear, Dougherty, and A. J. Hangas.

[Investigations in agricultural economics by the Ohio Station] (*Ohio Sta. Bimo. Bul. 180 (1936), pp. 80, 81*).—The table of index numbers of production, prices, and income by J. I. Falconer (E. S. R., 75, p. 269) is brought down through February 1936. A table by Falconer shows by years 1929–35 the estimated tons of different commercial feeds reaching the retail trade in Ohio.

[Investigations in agricultural economics by the Wisconsin Station, 1934–35] (*Wisconsin Sta. Bul. 435 (1936), pp. 134–144, figs. 3*).—Included are (1) chart, table, and text showing the average retail margins on different kinds of cheese, as found by M. A. Schaars in a study of 74 independent stores throughout the United States; (2) a table and other data by Schaars comparing the rail and truck costs in shipping hogs; (3) some data as to the value of and kinds of commodities purchased in 1934 through farmers' cooperative purchasing associations, as found in a study of such associations by R. K. Froker, M. A. Abrahamsen, W. F. Finner, and J. G. Knapp; (4) a table by H. H. Bakken showing the production costs—raw material, direct operating, marketing, and administration—and the selling price per case of 48 cans of condensed and evaporated milk by years 1929–32, as found in a study of two large Wisconsin plants; (5) a chart showing the annual State, county, and local direct tax levies for school support, 1921–35, in a typical low property value county, as found in a study of the distribution of State aids by B. H. Hibbard and K. H. Parsons; and (6) a map dividing the State into six type-of-farming regions and 15 type-of-farming areas, and a table showing the percentages of crop land in each region intertilled, in small grain, and in hay in 1929, as determined in a study made by the station, the Wisconsin Crop and Livestock Reporting Service, and the U. S. D. A. Agricultural Adjustment Administration and Bureau of Agricultural Economics.

Income parity for agriculture, L. H. Bean (*U. S. Dept. Agr., Agr. Adjust. Admin., 1936, pp. [15], figs. 3*).—This is "a brief discussion of (a) price or income as a standard for agricultural recovery, (b) a measure of income parity, and (c) the ratio of the purchasing power of net income per person on farms and the purchasing power of income per person not on farms."

Western land policies and recent ownership trends, R. R. Renne (*Jour. Land and Pub. Util. Econ., 12 (1936), No. 1, pp. 33–43, figs. 5*).—This in a contribution from the Montana Experiment Station. Maps and a table are included and discussed, showing the total percentages in 1934 of the total land area of the State owned by the Federal Government, the State, counties, miscellaneous public agencies, railroads, investment and mortgage companies, lending agencies (commercial banks, insurance companies, Federal Land Banks, and joint stock land banks), miscellaneous corporations, individuals resident in the State,

and individuals nonresident in the State. The changes from 1925 to 1934, the causes for the changes, and the possible methods for correcting the present maladjustments are discussed.

Rural real estate tax delinquency in New Hampshire, H. C. GRINNELL (*New Hampshire Sta. Bul. 290 (1936), pp. 19*).—This bulletin presents a general summary of the data collected in New Hampshire for the period 1928–33 in cooperation with the Bureau of Agricultural Economics, U. S. D. A. The irregularities in the local tax collection practices are discussed. Analysis is made of the extent and trends in tax delinquency 1928–32 and the extent of tax sales, their relation to delinquency, and tax sale redemptions 1929–32.

Tax advertisements nearly doubled from 1928 to 1931 and then declined in 1932 due to a lower average tax rate. More than 75 percent of the delinquent properties were classed as farm land with buildings. Two-thirds of the advertisements for the 1931 levy went to sale in 1932 as compared with about 56 percent for other years. The value of tax sales in 1932 was 232 percent of that in 1929, indicating that sales were increasing faster than advertisements and that a smaller percentage was being discharged before sale.

"Much of the tax delinquency and sale of rural real estate was of short duration, being repeatedly delinquent or sold for more than one year, but only for one year at a time. Thus the increase in each year's delinquency or sales over the previous year's figures are of major importance in that they more nearly represent a new delinquency and indicate the increasing burden of property taxes on rural people. . . .

"The officials of many towns have been found to be negligent in the administration of tax laws. Irregularities in local practices with respect to the collection of taxes, more particularly those concerned with the advertisement and sale of delinquent properties, affect the comparability of the data assembled for this project."

The production credit system of 1933, J. K. GALBRAITH and J. D. BLACK (*Amer. Econ. Rev., 26 (1936), No. 2, pp. 235–247*).—"This paper describes briefly the structure of the system and outlines the scale of loaning operations to date. At the end of 1934 it seems probable that the system had approximately one-tenth as many loans outstanding for agricultural purposes as did the commercial banks. The competitive position of the system, particularly in relation to country banks, is discussed in some detail. Attention is also given to the perplexing problem which the system faces in its efforts to maintain a uniform loan rate for all parts of the country."

Agricultural labor in the United States, 1915–1935, compiled by E. M. COLVIN and J. C. FOLSOM (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 64 (1935), pp. VII+493*).—This mimeographed bibliography includes 1,746 selected annotated references grouped under the following headings: General agricultural labor, agricultural ladder, child labor, contract labor, cost and standard of living, efficiency, employment and unemployment, employment agencies and services, farm laborers' allotments, hired man, history, hours of labor, immigrant labor, insurance, labor displacement, labor management, labor unions, legislation, migration to cities, migratory labor, mobility, occupational hazards, overtime pay, profit sharing, sharecroppers, statistics, strikes and labor unrest, supply and demand, training, wages and perquisites, women as agricultural laborers, and workmen's compensation.

An economic study of hog production and marketing in South Carolina, M. GUIN (*South Carolina Sta. Bul. 305 (1936), pp. 27, figs. 9*).—The purposes of this study were to ascertain the present cooperative position of the hog enterprise in South Carolina and its relation to crop enterprises, other livestock

enterprises, and other corn-hog producing areas of the United States; to determine the economic influences of the AAA corn-hog production program upon corn-hog production in South Carolina especially in regard to the parts of the State in which reduction took place and the crops planted on land taken out of corn; and to determine the prospective status of the hog enterprise in the State. The author concludes as follows:

"While swine production is responsive to a number of influences, the corn enterprise is the dominant influence. The yearly changes in corn acreage in South Carolina give a good explanation of the annual changes in number of hogs on farms on January 1 of the following year. Corn acreage is greatly affected by changes in cotton acreage. When cotton acreage is increased, corn acreage is decreased, and vice versa. Crops other than cotton have only a small effect on corn acreage and hog production.

"The AAA corn-hog program in South Carolina did not have a great influence on hog production. This was due largely to the fact that South Carolina is a deficit corn and hog producing State. More farmers would have signed corn-hog contracts in 1934 had they cared to reduce corn acreage. Most of the farmers do not produce enough corn for home consumption. Forage crops were the usual crops grown on the land taken out of corn production in 1934.

"With the use of more home-grown feed, the hog enterprise is likely to increase slowly during the next several years in South Carolina, at least to the extent of supplying home needs for pork. A number of the present disadvantages of hog production can be overcome."

An economic study of poultry farming in Virginia, J. L. MAXTON (*Virginia Sta. Bul. 300 (1936), pp. 58, figs. 10*).—Data were collected by the survey method from 164 farms in 1931 and 213 farms in 1932. The farms in 1931 ranged from 1 to 700 acres in size, averaging 112 acres, with an average of 37 acres of crops. The poultry flocks ranged from 235 to 2,596 birds, averaging 737. In 1932 the farms ranged from 1 to 550 acres in size, averaging 108 acres, with an average of 42 acres in crops. The flocks ranged from 159 to 2,962 birds, averaging 656. Analysis is made of the farm capital, receipts from poultry crops, dairy products, livestock and miscellaneous services, expenses, etc.; of the feed, man labor, horse work, and other costs in producing eggs, hatching chicks, and raising pullets; of the returns from eggs; and of the factors affecting labor income on poultry farms. The production per hen necessary to pay for feed, profitable poultry practices, the markets for poultry and eggs, and the outlook for poultry and egg production in Virginia are discussed.

The average capital investment for the farms studied was $13,124 in 1931 and $12,299 in 1932. The average net cost of producing eggs was 25.2 ct. per dozen in 1931 and 20.8 ct. per dozen in 1932. Labor incomes averaged $280 in 1931 and $56 in 1932.

Higher than average number of hens, better than average hens, increased labor efficiency, increased feeding efficiency, low mortality in flocks, and high egg production in the fall months gave lower than average cost of producing eggs. Early hatching of chicks, maintenance of good body weight of layers by proper feeding, year-round feeding of some form of milk and green feed, and a high quality of hens resulted in a high egg production per hen. In general, there was a close correlation between low cost of egg production and high labor income. Farmers selling baby chicks, pullets, breeders, and broilers in addition to eggs were generally more successful than those specializing in intensive egg production.

Egg production, monthly costs, and receipts on New Jersey poultry farms, November 1934–October 1935, L. M. BLACK and J. C. TAYLOR (*New Jersey Stas. Hints to Poultrymen, 23 (1936), No. 2, pp. 4*).—This is a summary of detailed costs of egg production compiled from the records of 21 cooperators representative of all sections of the State and including flocks of various sizes.

Seasonal costs and returns in producing milk in Orange County, New York, L. C. CUNNINGHAM ([*New York*] *Cornell Sta. Bul. 641 (1936), pp. 41, figs. 7*).—Detailed records relative to farm receipts, expenses, inventories, cropping systems, and other farm practices, with special reference to the seasonal costs and returns in producing milk, were obtained from 111 dairy farmers for the year ended April 30, 1931. The area and the farms studied are discussed. Analysis is made of the yearly costs and returns in producing milk and the effects of costs per 100 lb. of milk, rates of production, size of herd, labor efficiency, and other factors on the costs and returns. Some analysis is also made of seasonal and monthly costs.

The average capital per farm was $16,000. Labor income averaged $270 per farm. About 40 percent of the farmers showed losses, but 10 percent had labor incomes of $2,000 or more. Cost of feed constituted 52.1 percent of the total yearly costs of milk production, man labor 26.3, and depreciation 9.3 percent. No other item of the 10 studied amounted to as much as 5 percent. The average net cost of producing milk was $2.70 per hundredweight and the average price received $2.72 per hundredweight. The average return to labor from the cow enterprise was 30.5 ct. per hour. The net cost per hundredweight of milk fluctuated from 67 percent of the yearly average in June to 117 percent in April. Rate of milk production was the most important factor affecting costs and returns. Feeding practices and season of production had a decided effect on milk production per cow. Large-sized herds made possible low unit cost of production. In general, the highest incomes were obtained by dairymen who kept good cows and a sufficient number of cows to use the available labor force efficiently.

Analysis of open commitments in wheat and corn futures on the Chicago Board of Trade, September 29, 1934, D. B. BAGNELL (*U. S. Dept. Agr. Circ. 397 (1936), pp. 20, figs. 8*).—Examination was made of the records of 111 clearing firms and 507 nonclearing commission firms, and information was obtained by correspondence from three domestic and 11 foreign firms. Analysis is made of the number of accounts and volume of open commitments, distribution of accounts and open commitments between speculators and hedgers, size of accounts, and geographic distribution and occupation of traders.

At the close of business September 29, 1934, 18,364 individuals, firms, and corporations held future contracts in wheat or corn or both on the Chicago Board of Trade. Of the 13,194 wheat accounts, 88 percent were speculative. Of the 8,089 corn contracts, 89 percent were speculative. Approximately 48 percent of those in wheat were for less than 5,000 bu. and 92 percent for less than 25,000 bu. Forty-seven percent of the long speculative accounts in corn held less than 5,000 bu. and 91 percent less than 25,000 bu. Speculators held 75 percent of the long contracts in wheat and 74 percent of those in corn. Hedgers held 82 percent and 79 percent, respectively, of the short interest. Every State in the United States was represented in the accounts but nearly 90 percent originated in the 18 States located mainly in the grain-growing area of the Middle West. There was a considerable participation from Canada, Europe, and the Orient. The larger occupational groups having accounts were farmers, who had 1,492 contracts in wheat and 1,047 contracts in corn, and housewives with 802 contracts in wheat and 496 contracts in corn.

"The hedging burden was about equally divided between two groups, one consisting of farmers, clerks, small merchants, and others of apparently limited means, and the other made up of professional traders, executives, financiers, and the like.

"Information obtained by the Administration as the result of special studies, surveys, and investigations shows conclusively that the small speculators play a most important part in the merchandising of the Nation's grain. They are nearly always on the long side, in contrast to the large professional traders who are as likely to be sellers as purchasers. If not subjected to periodic 'shaking-out' processes, these small traders would doubtless be an even more dependable group of hedge carriers."

The production-consumption balance of agricultural products in Michigan.—Part 2, Livestock and animal products, G. N. MOTTS (*Michigan Sta. Spec. Bul. 269 (1936), pp. 40, figs. 10*).—This is the second bulletin in the series previously noted (E. S. R., 74, p. 558). Charts and explanatory text show the production in the State, shipments to and from other States, and estimated consumption or utilization in the State, the figures used being the averages for the following years: Livestock and meats, 1928–32; wool, 1932–33; and dairy products and poultry and eggs, 1929–33.

The ratios of production in the State to the consumption within the State were found to be as follows: Beef 45 percent, veal 134, pork 45, lamb and mutton 124, wool 480, milk and cream 101, butter 100, cheese 69, condensed and evaporated milk 166, dried and powdered milk 171, poultry 59, and eggs 78 percent. The percentages of State consumption from the Michigan production were beef 40, veal 75, pork 35, lamb and mutton 50, wool 24, milk and cream 99.3, butter 17.4 to 17.8, cheese 41, poultry 57, and eggs 70 percent.

A study of the demand for potatoes in the Twin Cities, L. F. GARREY (*Minnesota Sta. Bul. 324 (1935), pp. 24, fig. 1*).—This study is based on data obtained during March and April 1935 from 1,356 retail stores, 20 hotels, 128 restaurants and cafeterias, and 21 hospitals in Minneapolis and St. Paul, Minn. About 43 percent (959,410 bu.) of the consumption of potatoes in the two cities was covered. Analysis is made for the stores of the kinds and quantities of potatoes sold in the different types of stores, methods of sale, unit of sale, source and frequency of purchase, grades purchased, the relation of income of consumers to kind of potatoes used and prices paid, etc. For the hotels, eating places, and hospitals analysis is made of the kinds and quantities of potatoes used, prices paid, size preferences, methods of cooking, sources of purchase, etc. The objections made to Minnesota potatoes are also analyzed.

About 30 percent of the potatoes used in the two cities were grown outside the State. About 50 percent of the objections to Minnesota potatoes were on the grounds of disease, poor quality, and lack of uniformity. There was found to be a considerable demand for the very best quality of potatoes, and the large proportion of russet potatoes from the western States used indicates that Minnesota-grown potatoes do not possess all the qualities required by this rather select trade.

Ninety percent of the potatoes shipped out of Minnesota were found to go to 20 cities, chiefly southeast of the State, where the State was at some disadvantage in competing with Wisconsin and Michigan potatoes. This disadvantage, however, could be offset, the author believes, by producing and marketing potatoes of a higher quality and greater uniformity.

World consumption of wool, 1928–35 (*London: Imp. Econ. Com., 1936, pp. 306, [pls.] 9*).—This is an analysis of the consumption and trade in wool and wool products in the British Empire and other countries of the world.

"The plan adopted for each country has been to open with a brief introductory paragraph, followed by a statement of the machine equipment and labor supply; then to estimate from trade and wool production statistics the available supplies of raw wool; to summarize the available information on production and trade in semimanufactures; and to conclude with the output and trade in finished goods—more particularly clothing tissues. The hosiery and carpet industries have been included only where their consumption of wool is sufficiently high to render them a factor of major importance. The highly complicated and technical nature of tariff and quota regulations preclude any but the briefest references."

A chapter (pp. 258–293) discusses the prices of raw wool, wool rags, semimanufactures, and tissues.

Crops and Markets, [April–May 1936] (*U. S. Dept. Agr., Crops and Markets, 13 (1936), Nos. 4, pp. 113–144, figs. 3; 5, pp. 145–176, figs. 3*).—Included are tables, reports, summaries, charts, etc., of the usual type. No. 5 also includes tables showing by States and by years 1920, 1925, and 1930–36, inclusive, the estimated value per acre of farm real estate on March 1 in terms of pre-war average (1912–14) value.

RURAL SOCIOLOGY

[Investigations in rural sociology by the Wisconsin Station, 1934–35] (*Wisconsin Sta. Bul. 435 (1936), pp. 145–150*).—Included are (1) a brief statement of findings as to the occupation and earnings of young people in a study in Wood and Waushara Counties by E. L. Kirkpatrick; (2) data regarding the reasons for households receiving relief and the rehabilitation possibilities and needs of the relief households, as shown by a study by Kirkpatrick in cooperation with the Rural Resettlement Administration in the Central Wisconsin Nesting and Phelps-Crandon areas of Wisconsin submarginal land purchase tracts; (3) findings as to the cost of living of farm, nonfarm, open country, and village groups in the Forest County section of the Crandon land purchase area, in a study of 290 families, by Kirkpatrick, A. Mucks, and M. L. Cowles; and (4) data as to the changes in the number of rural families receiving relief in 1934 and 1935 and the types of households—farm, owner-operator, tenant, and nonagricultural.

The libraries of Missouri: A survey of facilities, E. L. Morgan and M. W. Sneed (*Missouri Sta. Res. Bul. 236 (1936), pp. 94, figs. 17*).—"This is a statistical study of the library facilities in Missouri. The location and resources of all public libraries and for most of the other types are analyzed and compared. Particular consideration is given to the comparative distribution of libraries and to the services they render rural as compared with urban population. Here, it is indicated that more than one and one-half million people in Missouri, most of them rural, are not served by public libraries. While revenue for maintenance has declined during the past 5 yr., the total book circulation has materially increased in all classes of libraries."

Farm versus village living in Utah, [II], J. A. Geddes (*Utah Sta. Bul. 269 (1936), pp. 82, figs. 30*).—This, the second of a series of three publications dealing with conditions found in Plain City (E. S. R., 72, p. 127), deals with the use of local community agencies and institutions and of outside community offerings in neighboring towns and cities.

Among other findings, it is concluded that "education increases community participation up to and including completion of high school. . . . There is no evidence that increasing education brings improved balance in the selec-

tion of offerings in the various fields of living. The fields that are emphasized by the well-educated as well as by the uneducated are: Education, recreation, religion, and vocation. Neglected fields pertain to culture, government, family life, and health. . . .

"Community participation increases from 6 to 18 yr. of age where it reaches a high point at 18. After 21 a rapid decline occurs. From 24 to 30 a slight decline continues. Between 30 and 44 up-and-down movements take place, but with little comparative gain or loss. From the 44th to the 59th years attendance increases. After 59, participation definitely declines. If, however, schools and recreation are eliminated, the golden age of community participation lies not alone in youth but also in the 10-yr. period from 50 to 59 yr. and extending on a level above the average up to the 64th year. With advancing age, the two village-farm groups maintain a higher community participation average than do the farm-dweller and nonfarm groups. Community-mindedness continues with advancing age to show greater strength within the village."

Forces affecting participation of farm people in rural organization, D. E. LINDSTROM (*Illinois Sta. Bul. 423 (1936), pp. 77–127, figs. 19*).—This study was undertaken to gain an accurate estimate of the social forces affecting the participation of farm people in rural organization in 4 rural townships in central Illinois. The 250 households studied included 975 individuals, averaging 3.9 persons per household. Eighty-seven percent of the total number were of native parentage. Slightly more than half had less than an eighth-grade education.

About one-fourth of the heads of households were owners or part owners of farms, two-thirds were tenants, and one-sixth were farm laborers. The average farm operator spent more than nine-tenths of his time on the farm, and he and all members of his family of productive age were normally at work on the farm more than one-third of the time. They spent one-fourth of their time in rest and recreation, which left slightly more than one-third of the time for sleep. More off-the-farm time was spent in trading than for any other one purpose.

The farmers in this study normally shipped their livestock through farmer-owned associations or by truck to large marketing centers, such as Chicago or St. Louis. Their grain was delivered to the village or to the country elevators. Most of them patronized local banks.

Voluntary organizations drew their support mainly from the most stable members of the communities. Participation went hand in hand with the development of leaders. All leaders were expected to have such personal qualities as friendliness, honesty, courage, industry, perseverance, faithfulness, and ability to plan.

Rural youth: Activities, interests, and problems.—I, Married young men and women, 15 to 29 years of age, W. A. ANDERSON ([*New York*] *Cornell Sta. Bul. 649 (1936), pp. 55, fig. 1*).—This is a report of the results of a survey conducted by the Tompkins County Development Association to reveal the needs of the rural young people in that county. It shows what married young people are doing and what they would like to do. The facts reported challenge the attention of rural organizations and agencies concerning their responsibility for giving larger services to those who are starting rural homes. They also indicate the importance of such information as the basis for planning programs of work by rural organizations and the desirability of ascertaining similar information by local groups in other counties.

The activities, interests, and problems of 347 married young men and [redacted] who live in the open country and villages of Tompkins County [redacted]

One-third of those interviewed were men and two-thirds were women. Their average ages were 28 and 24 yr., respectively. Most of them had resided 5 yr. or more in rural environments. Of the group, 30 percent lived on farms, 40 percent in villages, and 30 percent were open-country, nonfarm residents.

The schooling of these young people averaged more than 2 yr. of high school. Their occupational backgrounds were farming, skilled work, and unskilled labor. At the time of the study 81 percent of the young men were employed full time at remunerative occupations, 11 percent were employed part time, and 4 percent were unemployed. Of the young women, 86 percent were engaged in housework, 8 percent were gainfully employed all the time, and 5 percent had part-time work. Of the young men, 95 percent had persons dependent upon them. All but 5 percent were responsible, wholly or in part, for the care of other people. Only 3 percent of the young women had others dependent upon them.

Of the young men, 82 percent, and of the young women, 67 percent had received no organized training for any vocation.

Need for occupational guidance and training is emphasized by the number of young men who would like to change their vocations. Leisure time activities engaged in most frequently by both men and women were the indoor, passive type, including reading, card playing, checkers, chess, and other games, and listening to the radio. Outside activities were second in importance, while household activities were third. Hobbies and outdoor sports ranked fourth in importance.

The home was the main center of activities, while schools, churches, and other institutions were used only occasionally for recreation. Of the young men, 56 percent, and of the young women, 48 percent had 2 hr. or less per day for leisure activity. In the leisure program, reading is of major importance to young men and women. Magazines were read in 9 of each 10 of the homes, many of them being of the sensational type. Books were much less regularly read than were the magazines and newspapers.

One-half of the young men and women were members of no formal organization of any kind. The organizations to which the young men and women belonged were the church, the grange, the farm bureau, and the home bureau.

Those interviewed suggested that communities were doing little for the young people, and that provision be made for social and recreational needs. They recognized sociability as a chief need.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Selected list of American agricultural books (*U. S. Dept. Agr., Library, 1936, pp. [3]+41*).—This is a mimeographed selected list of approximately 460 cyclopaedias and books on general agriculture; crops; soils; fertilizers; horticulture; landscape gardening; forestry; animal husbandry; dairying; plant and animal breeding; bees; insect pests; insecticides and fungicides; plant diseases; agricultural science; farm buildings, agricultural engineering, and agricultural machinery; agricultural economics; rural sociology; and agricultural history.

Space and equipment for homemaking instruction (*U. S. Dept. Int., Off. Ed., Vocat. Ed. Bul. 181 (1935), pp. 153, figs. 148*).—This is a guide to the location and arrangement of homemaking departments in vocational teaching. The location, layouts, space requirements, furnishings and equipment, and general storage for activities relating to different types of work, and general considerations—heat, ventilation, light, electricity, floors, etc.—are discussed with numerous illustrations, floor plans, etc. The preparation of teachers and the functions of home economics supervision are also discussed.

Consumer-buying in the educational program for homemaking (*U. S. Dept. Int. Off. Ed. Vocat. Ed. Bul. 182 (1935), pp. XIII+205*).—This bulletin was prepared to serve as a guide for teachers in secondary schools and in the field of adult education principally in determining what to teach to groups at different educational levels, in planning for the more effective types of organization in which to include consumer-buying education, in developing effective methods of teaching, in selecting and using references and illustrative material, in utilizing local facilities for worthwhile consumer-buying programs, and in determining in an experimental way with a given group the solution of certain problems in consumer-buying.

Chapter I discusses the need for education in consumer-buying and its relation to other aspects of homemaking. Chapter II, suggestions for consumer-buying at the secondary school level, discusses the contribution of different high school subjects to consumer-buying and other parts of consumer education and the bases for determining emphasis in consumer-buying, and makes suggestions for programs in consumer-buying. Chapter III, suggestions for consumer-buying education for adults, deals with the planning for the program in the community, the adapting of methods to adult needs, and program possibilities for adults. Part II, outlines and source material, outlines the major objectives, including for each a statement of minor contributing objects, suggestions for content, illustrations of pupils' experiences, and a list of references.

World progress in home economics, 1927 to 1934, I. H. Gross (*Jour. Home Econ., 28 (1936), No. 4, pp. 233–240*).—This is a brief of the General Report, Section I, from the Fifth International Congress of Home Economics held in Berlin in 1934, to which 17 countries sent representatives.

In this brief the likenesses and differences among the countries in the curriculum and teaching methods in the schools, extension, research, special courses, and training of teachers have been considered and particularly compared with that of the United States.

An accompanying list summarizes the points stressed in the reports of the International Congress and the progress made in home economics since 1927.

FOODS—HUMAN NUTRITION

[**Food and nutrition studies by the Massachusetts Station**] (*Massachusetts Sta. Bul. 327 (1936), pp. 35, 36, 37, 59, 60, 62, 63*).—Included in this annual report are summaries of studies, several of them representing extensions of earlier work (E. S. R., 73, p. 711), by W. S. Mueller and W. S. Ritchie on the nutritive values of plain and chocolate-flavored milks (pp. 35, 36); by M. J. Mack in cooperation with C. R. Fellers on the vitamin C content of orange-flavored drinks (p. 37); by H. S. Mitchell and O. A. Merriam on the cause and control of nutritional cataract (pp. 59, 60); by Mitchell and G. M. Cook on the use of banana and milk in diets for weight control (p. 60); by J. A. Clague on the number of micro-organisms on dried food (p. 62); by Fellers, Clague, F. P. Griffiths, W. S. Conway, Jr., and V. K. Watson on the Atlantic whiting, mackerel oil, and crab meat (p. 62); by Fellers, Clague, and W. Stepat on the ascorbic acid (vitamin C) content of raw, cooked, and canned rhubarb (p. 62); by Fellers, A. S. Levine, and W. A. Maclinn on home canning research (pp. 62, 63); by Fellers and J. Miller on the use of corn sugar in manufactured fruit and vegetable products (p. 63); by Fellers and Stepat on frozen food investigations (p. 63); by Fellers and Clague on the utilization of cull [illegible] (p. 63); by Merriam, Fellers, and P. D. Isham on nutritional studies on [illegible]

berries (p. 63); and by Fellers, Isham, W. B. Esselen, and R. E. Buck on vitamin D investigations (p. 63).

[Studies in foods and nutrition by the North Dakota Station], E. LATZKE and D. BERRIGAN (*North Dakota Sta. Bul. 286 (1935), pp. 68–72*).—This progress report includes summaries of studies on cooking methods for veal and edible meat byproducts, meat canning, the influence of cooking and canning on the content of vitamins B and G in meat, the effect of pasturage shortage on the quality and palatability of beef, the utilization of rhubarb for jelly and squash for sirup, the vitamin G content of Buttercup squash, and the use of lard in cake making.

[Studies in foods and nutrition by the Wisconsin Station] (*Wisconsin Sta. Bul. 435 (1936), pp. 56–67, 81, 82, 150, 151, figs. 2*).—Included in this progress report are summaries of studies, several of which represent extensions of earlier work (E. S. R., 74, p. 568), by G. O. Kohler, C. A. Elvehjem, and E. B. Hart on the availability of iron in common foods (p. 56); by M. O. Schultze, Elvehjem, and Hart on the availability of copper from natural sources (pp. 56, 57); by Elvehjem, D. R. Mendenhall, A. Siemers, and L. Willis on the response of children to iron and copper combined as compared with iron alone (p. 57); by H. J. Deobald and Elvehjem on the development of rickets through overdosage of iron (pp. 57, 58); by H. Steenbock in cooperation with M. H. Irwin, J. H. Weber, and E. Lease on the effects of feeding rancid fats to experimental animals (pp. 58, 59); by M. A. Ingraham and Steenbock on the synthesis of carotene from carotenoids in plants, including algae (pp. 59–61); by O. L. Kline, A. Arnold, Elvehjem, and Hart on the attempt at isolation of the growth factor of liver (pp. 61, 62); by H. Parsons, J. Lease, and E. Kelly on attempts to isolate the toxic factor of raw egg white (p. 62); by D. Husseman on the home canning of tomato juice to preserve its vitamin C content (pp. 62, 63); by Elvehjem and Arnold on the vitamin B_1 content of animal tissues and the stability of this vitamin during the canning of meat at different temperatures (pp. 63, 64); by Elvehjem and C. J. Koehn on the separation of flavines from vitamin G in liver (p. 64); by Kline, H. R. Bird, Elvehjem, and Hart on the development of a new synthetic ration for the study of vitamin B_4 (pp. 64–66); by F. C. Schoenleber and Steenbock on the stability of vitamin B_1 and the destruction of vitamin C (pp. 66, 67); by C. A. Bauman on the stability of vitamin A in milk during irradiation (p. 67); by R. W. Haman and Steenbock on the relative antirachitic potency (for chicks) of irradiated milk and yeast milk and of irradiated plant and animal fats (p. 67); by P. L. Pavcek, W. H. Peterson, and Elvehjem on factors influencing the growth and vitamin B_1 content of baker's yeast (pp. 81, 82); and by M. L. Cowles a survey of winter dietary deficiencies in 109 farm families.

Some methods and apparatus used in measuring the quality of eggs for cake making, F. B. KING, H. P. MORRIS, and E. F. WHITEMAN (*Cereal Chem., 13 (1936), No. 1, pp. 37–49, figs. 4*).—In this contribution from the U. S. D. A. Bureau of Home Economics, detailed methods are described for measuring the lifting power of eggs, based on quantitative measurements of specific volume, tensile strength, and compressibility of sponge cake. Cake volumes were measured by the planimeter method, as described by Platt and Kratz (E. S. R., 69, p. 462), and also by seed displacement, with preference given to the latter as being more rapid and giving more consistent results. Tensile strength was determined essentially as described by Platt and Kratz except that a special miter box was used for the cutting of the sample. Compressibility was determined by means of a penetrometer similar to that described by Bonney, Clifford, and Lepper (E. S. R., 65, p. 190).

The data reported include pH, total CO_2 in 100 cc, and the total solids of the white, yolk, and magma and the viscosity of the magma of two series of eggs from mature hens and one from pullets, and the physical measurements noted above for a series of sponge cakes made from the same eggs. "Most uniform results were obtained when the cake batter was added to the pans one-third at a time in rotation, followed by making the quantitative measurements on the finished cakes in a room kept at constant temperature and humidity. The measurements of H-ion concentration, total carbon dioxide of white and yolk, viscosity of magma, total solids of white and yolk of fresh eggs do not appear to be definitely related to the quantitative cake measurements."

Utilization of meat by human subjects, II, III (*Jour. Nutr., 9 (1935), No. 6, pp. 677–683, 685–690*).—In continuation of this series of studies at the Kansas Experiment Station (E. S. R., 73, p. 869), two papers are presented.

II. *The utilization of the nitrogen and phosphorus of round and liver of beef*, Z. Long and M. S. Pittman.—As determined by the same methods as in the first study, the nitrogen of the round of beef was found to have almost the same coefficient of digestibility as that of beef liver. A slightly more favorable nitrogen balance was obtained on the round than on the liver. The phosphorus balance was but little lower, in spite of the fact that the diet supplied less than two-thirds as much phosphorus as in the period in which liver was used. As collagen and elastin were higher in the round than in the liver, these constituents could not have affected seriously the utilization of the total nitrogen of the cut.

III. *The utilization of the nitrogen and phosphorus of beef heart*, B. L. Kunerth, I. M. Chitwood, and M. S. Pittman.—The nitrogen of beef heart was found to be utilized at least as well as that of beef round, as judged by practically identical coefficients of digestibility and losses of urinary nitrogen. Slight differences in phosphorus utilization were in favor of the heart. The greater amount of connective tissue in the heart apparently did not prevent good utilization of both nitrogen and phosphorus.

The cooking quality, palatability, and carbohydrate composition of potatoes as influenced by storage temperature, R. C. Wright, W. M. Peacock, and T. M. and E. F. Whiteman (*U. S. Dept. Agr., Tech. Bul. 507 (1936), pp. 20, fig. 1*).—In this investigation, a preliminary report of which has been noted (E. S. R., 65, p. 891), four varieties of potatoes were grown on the Arlington Farm, harvested when practically mature, and stored at controlled temperatures, usually 32°, 36°, 40°, 50°, 60°, and 70° F. for 65 days in 1929 or 124 days in 1931. The potatoes were then steamed, boiled, baked, french fried, and made into chips by a definite procedure for each method of cooking. The cooked products were judged while hot (except for the chips), and without added salt, by eight or nine judges for flavor, texture, and color.

For steaming, baking, and boiling, the best products followed when the potatoes were stored at temperatures of 50°, 60°, and 70°. Those stored at lower temperatures were less acceptable in quality, having an increased yellow color, a soggy or watery texture, and an unpleasantly sweet flavor. The best temperatures for storing potatoes for french fries were found to be 50°, 60°, and 70°, and for potato chips 60° and 70°.

Carbohydrate analyses were made by the described method at three successive periods, one coinciding with the cooking tests. For all varieties the sugar content increased as storage temperatures were lowered. With this increase the quality of the cooked product became poorer. Potatoes stored at 50°, however, showed upon analysis that their sugar and carbohydrate was almost the same as when these were put into storage.

Potatoes stored for 6 weeks at 40° and then moved to 70° for 6 weeks had a sugar content similar to lots when first put into storage. Lots stored at 36° and 32° and moved to 70° showed a relatively high sugar content. Potatoes stored for 6 weeks at 60° and 50° and then moved to 40° for 6 weeks showed an increase of sugar over those remaining continuously in storage at 40°.

Soybeans and soybean products for table use, E. J. KINGSLEY (*U. S. Dept. Agr., Bur. Home Econ.* [*1935*], *pp. 17*).—This mimeographed paper contains general information on field and garden varieties of soybeans, on their nutritive value, and on ways of preparing them for table use, both green and dried. Several recipes and directions for canning green soybeans are given. Soybean sprouts, flour, milk, curd, and a mash made from dried soybeans are described, their method of preparation and uses in the diet are given, with recipes.

Dietary uses of the banana in health and disease, L. J. BOGERT (*New York: United Fruit Co., 1935, pp. 32, figs. 2*).—This compilation of information on the banana includes its composition, its value as a food for adults, infants, and young children, and its use in various diseases and functional disorders.

The nutritive value of fungi, II, III, H. J. GORDICA, W. H. PETERSON, and H. STEENBOCK (*Jour. Nutr., 9 (1935), No. 6, pp. 691–714, figs. 9*).—In continuation of an earlier study at the Wisconsin Experiment Station in which it was shown that dried mycelium of *Aspergillus fischeri* and *A. sydowi* contain sufficient vitamin B complex to promote good growth of young rats and afford complete protection against polyneuritis at a 20-percent but not at a 5 percent level, further work was undertaken as noted below.

II. *The vitamin B, G, and B_4 content of the mycelium of Aspergillus sydowi* (pp. 691–700).—The addition of 10 percent of the mycelium of *A. sydowi* to a vitamin B-(complex) deficient diet furnished enough of the vitamin B complex to support good growth in rats, although better growth and performance were secured on 20 percent of the mold.

The mold at a 10-percent level furnished complete protection to chicks against polyneuritis, and at a 1-percent level prevented symptoms of pellagra in chicks on a ration low in vitamin G. On this diet good growth was not secured at levels below 3 percent. Mold added at a level of 30 percent to a diet deficient in vitamin B_4 completely prevented the onset of paralysis in chicks.

III. *The growth of rats on supplemented and unsupplemented mold proteins* (pp. 701–714).—The proteins of ground fresh mycelium from *A. sydowi* grown on a synthetic medium of inorganic salts and glucose were found insufficient to promote more than a slight amount of growth or to sustain life in young rats for a period longer than from 7 to 9 weeks when fed in amounts constituting 50 percent (dry basis) of the basal ration.

The most effective supplements to the mold proteins were the proteins of whole wheat and gluten feed, which supported very good growth when added to the basal ration at a 2.5- or 5-percent level. Good growth was secured with casein, skim milk protein, egg white, and yeast protein fed at levels of 2.5 and 5 percent as supplements to the mold protein, with better growth at the higher level. Gelatin at the same levels did not improve the growth-promoting power of the mold protein, nor was there any improvement in growth on the addition of 0.5 percent cystine, 0.5 percent histidine, 1 percent tyrosine, or 0.5 percent cystine plus 1 percent tyrosine to a ration containing 18 percent mold protein.

Proper processes for home canners, F. W. TANNER (*Jour. Amer. Dietet. Assoc., 11 (1935), No. 1, pp. 18–27, fig. 1*).—This is a further discussion (E. S. R., 73, p. 714) of various methods of canning in the home and of the dangers

involved in the use of any method other than steam pressure cooking in the processing of nonacid foods. In answer to the question "Must home-canned foods be sterile?" the statement is made that "spores of *Clostridium botulinum* should be destroyed and procedures should be used which will insure this. Other spoilage is the individual's problem. Home canners may perhaps accept much larger percentages of spoilage than factory canners."

The iodine content of foodstuffs [trans. title], R. BALKS (*Ztschr. Untersuch. Lebensmtl., 71 (1936), No. 1, pp. 76–93*).—Data are reported on the iodine content of samples of drinking water and milk from all of the districts of Westfalen (Westphalia); of potatoes, cabbage, carrots, and spinach grown on typical light and heavy soils in the same climatic zone; of carrots and spinach grown on soils fertilized with varying amounts of iodine; and of soils and various foods from goiter-free and goiter-endemic districts of Westfalen.

On the average, the iodine content of the water was within normal range and the content in the milk high. The vegetables grown on light and heavy soil types showed no characteristic differences in iodine content. The iodine content of spinach varied in proportion to the content of the soil in which it was grown and increased with iodine fertilization of the soil. Corresponding variations in the iodine content of carrots were found, but in contrast with spinach the addition of iodine to the soil increased the iodine content to only a slight degree. In the spinach samples grown with and without iodine fertilization, the iodine appeared to be in the same bound form. In endemic goiter regions the iodine content of the soils and vegetables grown thereon was smaller than in the goiter-free localities.

The copper content of urine of normal children, A. ROSS and I. M. RABINOWITCH (*Jour. Biol. Chem., 111 (1935), No. 3, pp. 803–805*).—An earlier study of the copper content of the urine of normal adults (E. S. R., 70, p. 130) has been extended to 50 boys between 8½ and 17½ yr. of age and normal except for noninflammatory orthopedic conditions.

The copper content of the urine ranged between 0.04 and 0.52 mg, with an average of 0.3 mg per liter and between 0.026 and 0.62 mg, with an average of 0.16 mg per day. In comparison with the figures obtained for adults, the concentrations of copper in the urine were similar, but the average amount excreted daily was appreciably smaller.

Blood buffer values in mineral deficiency, I. N. KUGELMASS (*Amer. Jour. Digest. Diseases and Nutr., 2 (1936), No. 12, pp. 730–732, fig. 1*).—The buffer values of the blood serum obtained from normal and rachitic infants have been determined electrometrically for the entire pH range. When plotted against the values of a nonbuffered solution, the curves obtained showed a marked diminution in the blood buffer capacity in rickets. This is thought to explain the relative instability of the acid-base mechanism in rickets and to indicate the importance of emphasizing base-forming foods such as milk, fruits, and vegetables in addition to vitamin D in the treatment of rickets.

The intermediary metabolism of fructose and galactose, H. J. DEUEL, JR. (*Physiol. Rev., 16 (1936), No. 2, pp. 173–215*).—"In the present review, the fate of fructose and galactose has been compared with that of glucose through the various stages in their intermediary metabolism. Absorption, transportation in the blood, glycogen formation, oxidation, ketolysis, and tolerance have each been considered in turn. The site of transformation to glucose, as well as the action of insulin on various processes, have been discussed."

An extensive list of literature references is appended.

The nutritive value of lactose in man, A. E. KOEHLER, I. RAFFETY, E. HILL (*Jour. Nutr., 9 (1935), No. 6, pp. 715–724, fig. 1*).—Lactose in

of 1.5 g per kilogram of body weight was given to 18 normal, 16 obese, and 18 diabetic subjects in the morning in a fasting state, and venous blood and urine samples were collected hourly for 4 hr. for glucose determinations. If the urine specimens gave a positive reduction test, the fermentability of the sugar was determined. In a small group of the normal subjects the blood inorganic phosphate changes after lactose ingestion were also studied. For purposes of comparison the blood sugar and urinary excretion were studied in 26 apparently normal subjects after glucose ingestion and in 6 normal subjects after starch ingestion. The recovery in the urine of lactose administered intravenously was also studied in 5 normal, 3 obese, and 3 diabetic subjects.

The average blood sugar values of normal subjects showed no important change after lactose ingestion, although individual variations were noted. The ingestion of starch caused nearly as great a rise in blood sugar as that following the administration of glucose and with a much greater total hyperglycemia. In the obese subjects there was a slight but definite elevation in blood sugar values after lactose ingestion, and in the diabetic subjects nearly as marked changes as after glucose ingestion.

The average recovery in the urine of intravenously injected lactose was approximately the same (89.3–93.2 percent) in the three groups of subjects. Ingested lactose caused a small fall in the inorganic phosphate content of the whole blood. In the normal subjects there was frequently a lactosuria after the ingestion of lactose, but this was never noted in the diabetic subjects.

In commenting upon these findings the authors suggest the possibility of a difference in the alimentary assimilation of lactose by the normal and diabetic subjects. They also call attention to the rapid rate of passing of lactose through the small intestines in the normal subject. "Such a rapid rate could easily interfere with hydrolysis and absorption even though lactase were present. Not only could the increased intestinal rate caused by lactose delay its absorption, but it could also interfere with the absorption of other foodstuffs."

Some normal variations in the emptying-time of the human stomach (using a carbohydrate meal), E. J. VAN LIERE and C. K. SLEETH (*Amer. Jour. Digest. Diseases and Nutr., 2 (1936), No. 11, pp. 671, 672*).—Data are reported on the emptying time of the stomach, as determined with the fluoroscope, following the consumption of a standard farina meal. Nine subjects, all normal young male medical students, were used in a total of 77 tests.

The emptying time of the stomach of any individual remained strikingly uniform from day to day, but great variations were found among the different individuals. The extremes of the individual averages were 1.03 and 2.81 hr., and the minimum, maximum, and average values for the separate tests 0.75, 3.5, and 2.08 hr., respectively.

The effects of prolonged muscular exercise on the metabolism, F. C. GOODHART and C. G. DOUGLAS (*Roy. Soc. [London], Proc., Ser. B, 119 (1936), No. 815, pp. 381–439, figs. 12*).—The authors served as subjects in this investigation of the effects of a long walk on the general metabolism of subjects not in athletic training. In most of the experiments the exercise, which was taken for the most part in the postabsorptive state after a normal diet, consisted in walking 10 miles on practically level gravel paths at a rate of 4.5, and in a few instances 3.5, miles per hour.

For both subjects the respiratory quotient during the work rose somewhat above the preliminary resting values in the early stages and fell gradually as the work continued. These changes could not be ascribed to accumulation of excess lactic acid in the blood, to a rise of body temperature, to changes in the CO_2-combining power of the blood, or to a developing ketosis. During

rest after exercise the respiratory quotients fell to average figures of 0.76 and 0.73 for the two subjects, respectively, and remained at these low figures for from 3 to as long as 9½ hr. The fall in respiratory quotient was accompanied by a definite excess of ketone bodies in the blood and by a progressive fall in the CO_2-combining power. Ketosis never developed during an uninterrupted walk, but appeared very soon after the beginning of the rest period and was associated with the total amount of muscular work done previously rather than with the rate at which the work had been done.

In experiments in which a high carbohydrate diet had been taken on the previous day, the general course of the respiratory exchange was about the same as following the normal diet, although the respiratory quotient was at a higher level. However, no ketosis developed after the exercise, nor was there a progressive fall in the CO_2-combining power of the blood. On the other hand, when the exercise was taken after a normal diet on the previous day and a normal breakfast, or 50 g of fructose or glucose with from 20 to 40 g of bread just before the exercise, postexercise ketonuria developed in the majority of the experiments, and the respiratory quotient fell nearly as low as in the normal postabsorptive state. "Confirmation has, therefore, been obtained of the view that a diet rich in carbohydrate taken on the day preceding the exercise may in certain respects have a greater influence than the ingestion of a quantity of easily assimilable carbohydrate shortly before beginning the work."

The economy of muscular exercise, D. B. HILL (*Physiol. Rev., 16 (1936), No. 2, pp. 263–291, figs. 2*).—In this review the term moderate work is used for activity which is less than three times, and maximal work for activity more than three times, the basal rate. Any activity between these limits is considered hard work. "In the first category the amount of energy transformed is small, the effects of the physical environment almost negligible, and if fatigue occurs it is of remote rather than of direct interest to the physiologist. With work approaching the limit of capacity, environmental conditions become more important. Fatigue appears to depend on the ratio of the work done to the capacity for work. In maximal work a temporary steady state may be attained, but a break-down eventually occurs for which any one of several functions may be responsible. The most intense work is chiefly anaerobic, and here no steady state is reached. Fatigue increases with the rapid depletion of energy reserves and the accumulation of unoxidized end products."

A modification of the Sherman method of studying the multiple nature of vitamins, with an application to vitamin G, T. S. HAMILTON and H. H. MITCHELL (*Jour. Nutr., 10 (1935), No. 2, pp. 117–128*).—The technic for determining whether or not a given vitamin has a multiple nature, first described by Sherman and Axtmayer (E. S. R., 58, p. 295) and later used by Stiebeling (E. S. R., 68, p. 568) and by Page (E. S. R., 71, p. 731), has been modified by using the paired feeding method of Mitchell and applied to the problem attacked by Page relative to the multiple nature of vitamin G. The results led to the conclusion that two vitamin G fractions prepared from skim milk powder according to the directions of Page show no evidence of the multiple nature of the vitamin. It is emphasized that "both the precision and the clarity of vitamin assay methods are improved by controlling the consumption by the experimental animals of the basal diet, as well as of the vitamin supplements."

Relation of castration to vitamin A-deficiency in the rat, K. H. MASON and J. M. WOLFE (*Jour. Nutr., 9 (1935), No. 6, pp. 725–734, figs. 2*).—Data are presented which confirm previous observations of Evans and Bishop (E. S. R., 50, p. 163), Baumann and Steenbock (E. S. R., 69, p. 630), Aberle [illegible]

p. 759), and others as to the sensitivity and reliability of continuous vaginal cornification as a criterion of early vitamin A deficiency. It is shown further that complete castration causes no significant difference in the time of appearance of continuous vaginal cornification or xerophthalmia in vitamin A-deficient rats of either sex, but that the castrate rat is less satisfactory than the noncastrate in following the repair of vaginal cornification during vitamin therapy.

Changes in the vaginal epithelium of the rat after vitamin A-deficiency, K. E. MASON and E. T. ELLISON (*Jour. Nutr., 9 (1935), No. 6, pp. 735–755, pls. 2*).—The changes occurring in the dry stain vaginal smears of castrate, noncastrate, and pregnant rats during the development of vitamin A deficiency and subsequent therapy are described in detail as observed in the examination of more than 52,000 vaginal smears.

In discussing the value of the test as a method for the biological assay of vitamin A, the authors state that "the vaginal smear test seems best applicable to the measurement of the interval elapsing between the repair of, and the return of, vaginal cornification following administration of single doses of vitamin A-containing substances. Unlike the other criteria of A deficiency (xerophthalmia and growth plateau), vaginal cornification is not significantly influenced by other factors (differences in inherent growth capacity of the test animal, general debility, extraneous causes of ocular irritation and infection) which may alter the reparative response when measured by other methods of assay. The lesser degree of A depletion required in the test animal, and the utilization of the same animal for repeated tests at intervals of a few weeks, offer additional advantages."

Attention is also called to recent clinical observations by J. W. Simpson (personal communication) showing the efficacy of a high intake of vitamin A in the treatment of senile vaginitis, thus suggesting that vitamin A is essential for the maintenance of a normal healthy state of the vagina in the human.

The demonstration of oestrus in the vitamin A-deficient rat by supravital study of the vaginal smears, K. E. MASON and E. T. ELLISON (*Jour. Nutr., 10 (1935), No. 1, pp. 1–11, figs. 2*).—In this further study of the vaginal smear test for detecting vitamin A deficiency, the supravital vaginal smear modification was used to demonstrate oestrus cycles in vitamin A-deficient animals in which abnormal cornification was too severe to permit their identification by dry stain smears. With the use of this method it was possible to differentiate between the effects of vitamin A deficiency and inanition on the vaginal epithelium. "The excessive keratinization, which more or less masks the underlying cyclic changes, is a primary response of the vaginal epithelium to lack of vitamin A. The increased lengthening of the cyclic change is indirectly due to associated growth retardation and decline."

The importance is emphasized of using for this test animals which show unusually good growth and vigor during the weaning period.

The vitamin contents of Philippine foods.—IV, Vitamins A and B_1 in various fruits and vegetables, A. J. HERMANO and P. J. AGUILA (*Philippine Jour. Sci., 58 (1935), No. 4, pp. 425–433*).—In this continuation of the series of papers noted previously (E. S. R., 73, p. 423), data are reported on the vitamin A content of 14 samples and the vitamin B_1 content of 10 samples of Philippine fruits and vegetables purchased on the open market. The samples were usually dried in an electric oven at 80° C. and fed in powdered form mixed with the basal diet to the extent of 10 percent of the diet. In the case of some of the fruits the samples were fed in 2-g amounts daily as a supplement to the basal diet.

Among the materials reported to be good sources of vitamin A were the lemosa fruit (*Artocarpus champeden*), the leaves of pechai or Chinese cabbage (*Brassica chinensis*), fern (*Ceratopteris thalictroides*), saluyot (*Corchorus olitorius*), squash (*Cucurbita maxima*), sweetpotato or kamote (*Ipomoea batatas*), pods of segadilla (*Psophocarpus tetragonolobus*), and frozen mango (*Mangifera indica*).

Of the samples tested for vitamin B_1 the tender leaves and tops of squash gave the best results, followed by the leaves and tops of mustard, saluyot, and sweetpotato, and the fruit of santol (*Sandoricum koetjape*).

The effects on the gastric juice of man of six weeks' deprivation of vitamin B_1, W. C. ALVAREZ, F. PILCHER, M. A. FOLEY, A. MAYER, and A. E. OSTERBERG (*Amer. Jour. Digest. Diseases and Nutr., 3 (1936), No. 2, pp. 102–107, figs. 3*).—Two adult subjects subsisted for 6 weeks and 1 for 2 weeks on a diet markedly deficient in vitamin B_1. Gastric analyses were made nearly every day, and the hemoglobin content and erythrocyte count of the blood were determined frequently.

One of the 2 subjects remaining on the experiment for 6 weeks developed a sore throat and later a cold, both of which were followed by a decrease in the acidity of the gastric juice but not in its pepsin content. In the other 2 there were no definite changes in the gastric juice throughout the experiment. The most striking change observed in all 3 subjects was in the hemoglobin content of the blood, which fell about 11 percent in spite of the fact that the iron content of the diet approached the Sherman standard for minimal requirement. There was also a drop of 7 or 8 percent in the erythrocyte count.

Vitamin C, ascorbic acid, C. G. KING (*Physiol. Rev., 16 (1936), No. 2, pp. 238–262*).—This review of the literature on vitamin C since 1932 is presented under the following headings: Identification and isolation, synthesis and general chemical properties, methods of analysis, biological methods of assay, physiological functions, and studies in relation to the general food supply.

An extensive list of literature references is appended.

Ascorbic acid (vitamin C) in sprouted oats, R. BOGART and J. S. HUGHES (*Jour. Nutr., 10 (1935), No. 2, pp. 157–160, figs. 2*).—In this contribution from the Kansas Experiment Station, the authors call attention to the fact that sprouted oats has proved a satisfactory winter source of vitamin C for guinea pigs. The method of sprouting is described, and data are given on the vitamin C content, as determined chemically by the technic of Bessey and King (E. S. R., 71, p. 137), of oats at different stages of sprouting from the first to the thirteenth day. A steady increase in vitamin C was shown up to the tenth day, after which there was a slight decrease. There was but little difference between the vitamin C content of oats sprouted in the light or dark.

A study of the distribution of the vitamin in the various parts of the plant at the seventh day of sprouting showed that over 90 percent of the vitamin was contained in the epicotyl. The remainder was distributed fairly evenly between the root and the kernel, with slightly more in the kernel. The quantity of vitamin C in 40 g of sprouted oats (the amount customarily included in the ration) was estimated to be between 6 and 7 mg, or considerably in excess of the requirement.

Vitamin content studies.—XVII, Apple marmalade enriched and not enriched with a concentrate of pine needle infusion as a source of vitamin C [trans. title], N. JARUSSOWA (*Ztschr. Untersuch. Lebensmtl., 70 (1935), No. 6, pp. 538–540*).—A commercial apple marmalade showed no antiscorbutic potency when fed to guinea pigs in daily doses of 1.5, 3.8, and 6 g, but the same marmalade enriched by the addition of 10 percent of a pine needle [illegible]

concentrate was protective in 3.8-g doses. It is calculated that such a marmalade would furnish sufficient vitamin C for man in amounts of 60 g daily.

Observations on the estimation of ascorbic acid by titration, E. W. McHENRY and M. GRAHAM (*Biochem. Jour., 29 (1935), No. 9, pp. 2018–2019, fig. 1*).—This paper describes a series of modifications in the titration procedure of Harris and Ray (E. S. R., 70, p. 426) and two methods of removing plant pigments before the titration. Data are then reported showing the rapid destruction of the vitamin in shredded or minced vegetables, a higher concentration in the parts of plant tissues in which photosynthesis is most active such as the top v. the lower part of head lettuce and the skin v. the inner edible portion of cucumbers, and an inverse relationship between size and vitamin content of ripe tomatoes. A more complete report is also given of previously noted studies on the quantities of reduced and reversibly oxidized ascorbic acid in various tissues (E. S. R., 73, p. 745) and the effect of cooking on the titration value (E. S. R., 73, p. 746).

TEXTILES AND CLOTHING

Application of the seed cotton fibrograph to lint cotton, K. L. HERTEL (*Jour. Tenn. Acad. Sci., 11 (1936), No. 2, pp. 147–152, fig. 1*).—Results of research at the University of Tennessee show that optical analysis may be applied advantageously to a cotton sample that contains parallel fibers in proportion to both their length and their length-frequency, and that has the fiber ends distributed at random, a distribution occurring in slivers, rovings, and yarns. The sample may be obtained by clamping a sliver or roving on a transverse line and combing out all fibers not held by the clamp. The resulting fibrogram pictures the arrangement of fibers as they appear in the yarn, and is also equivalent to the integral of the length-cumulative frequency curve of the cotton, or to the second integral of the length-frequency distribution curve.

A tangent to the curve at a point $l=l_1$ intercepts the length-of-fibers axis at the mean length of all fibers longer than l_1, and it intercepts the frequency axis at a distance from the origin proportional to the relative weight of the same fibers. A tangent at $l=0$ has an l intercept equal to the mean length of all the fibers in the sample.

The influence of position isomerism (structural differences) in azo dyes upon their fastness to light and washing, M. E. GRIFFITH and W. R. BROWN (*Ohio Sta. Bul. 565 (1936), pp. 19, Nos. 4*).—In this study the influence of the position of the sulfonic acid group in a series of isomeric monoazo dyestuffs on the properties of the dyestuffs was determined. Aniline and the ortho-, meta-, and para-sulfonated anilines were coupled to a series of naphthol sulfonic acids. The series of dyes were chosen so as to include a number of commercially important intermediates. Thirty-seven monoazo isomeric dyestuffs were prepared. The formula and properties, percentage of nitrogen, relative solubility in water at 20° C., and color of dye were noted. Other properties studied included visible absorption spectra, exhaustive properties, and the amount and kind of fading produced by light and washing tests.

White wool cashmere samples weighing 3.25 g were used for the application of dyestuff. The washing tests were made in a launderometer at 49°, using 100 cc of a 0.5 percent neutral soap solution. The machine was allowed to run for 30 min., after which the samples were rinsed several times in warm water, then in cold, squeezed, and dried in a current of air at room temperature before a fan. The tests for color fastness to light were made in a fadeometer, using the carbon arc as the source of artificial light. Tests of from 40 to 50

fadeometer hours were usually adequate to determine whether or not a color would fade, although some samples were exposed for 80 and 120 hr. Numerical expression for the loss of color due to washing was obtained by expressing the change in terms of percentage difference in reflectance at any one wave length. The degree of exhaustion varied with the different dyestuffs from 5 to 30 percent.

The position of the absorption band was only slightly affected by the position of the sulfonic acid group in the diazotized nucleus except that when this group was in the para position there was a decided shift of the band toward the red, as well as an increase in intensity. The position of the band fell between 470 and 500 mμ with the ortho- and meta-sulfonated compounds. The α-naphthol dyes had the greatest transmission in the yellow absorption band. The addition of a sulfonic acid group in the 3 position shifted the band to the red, in the 4 position still further to the red, and in the 5 position to the blue. The β-naphthol dyes had a greater absorption of blue than the α-naphthol dyes. The addition of the sulfonic acid group in the 6 position shifted the band to the red and in the 7 position to the blue. The disulfonic dyes showed very little difference, although the β-naphthol-6,8-disulfonic acid dyes showed more absorption of the blue than the others.

The percentage of absorption of the dyestuff by the wool was influenced by the presence of a sulfonic acid group in the diazotized nucleus. The ortho- and para-sulfanilic acid dyes were absorbed to a greater extent by the fiber than the meta-sulfanilic acid dyes. Substitutions in the naphthol ring had little effect upon the percentage of dyestuff absorbed. Color fastness to washing was increased by the presence of a sulfonic acid group in the diazotized nucleus, although the position had little or no effect. Substitutions in the naphthol nucleus did not greatly affect the fastness. Two types of light fading were observed—loss of intensity of color expressed as fading and change in hue called darkening. The ortho-sulfanilic acid dyes, both the mono- and disulfonic acid, were decidedly better than those of the other three series in color fastness to light. The β-naphthol dyes faded less than the α-naphthol dyes. The degree of darkening was little influenced by the presence or position of the sulfonic acid group in the benzene ring, although there was slightly less darkening in the case of the ortho- and para-sulfanilic acid dyes. The combined effect of fading and darkening indicated that the ortho-sulfanilic acid dyes were superior to the other three series. The combined effects of light and washing on the color fastness of the dyestuff, expressed as the utility factor, showed that ortho-sulfanilic acid dyes have greatest fastness, para-sulfanilic acid second, meta-sulfanilic acid third, and aniline dyes least. A comparison of substitutions in the naphthol nucleus relative to fastness of the dyes showed that β-naphthol dyes were superior to the α-naphthol for both the mono- and disulfonic acid substituted dyestuffs.

Cotton fabrics as effected by variations in pressure and in length of exposure during ironing, K. M. DOWNEY and R. E. ELMQUIST (*U. S. Dept. Agr., Tech. Bul. 517 (1936), pp. 32, figs. 14*).—This is an extension of a previous study (E. S. R., 71, p. 428) on three sheeting materials to determine the damaging effect on the fabric of variations in pressure and length of time of exposure. Deterioration was measured by breaking strength tests and by chemical and physical methods sensitive to small amounts of change.

Pressure exerted a considerable damaging influence on the fabric as shown by a decreased reflectance, methylene blue absorption, and breaking strength values and increased copper numbers and fluidity. For temperatures above 284° C., pressures of 4.0 lb. were three times more damaging

pressures. At 242° pressures of from 2.6 to 4.0 lb. were necessary to equal the damage done by 1.3 lb. at temperatures from 242° to 254°. Measurable change with the cool roll was first noted at 208° and 250° for the pressures of approximately 4.0 and 1.3 lb., respectively. The same initial changes were noted with the hot roll at temperatures 25° lower. The change from 1 to 60 sec. in still contact resulted in a small uniform increase in deterioration at 167° and a large rate of change decreasing considerably after 30 sec. at 255°. Exposures of from 5 to 15 sec. at 167° and 1.3 and 4.0 lb. pressure caused no deterioration, but 1.0 and 2.4 sec. caused measurable changes at the same limiting pressure at 255°. The rate of deterioration with pressure was greater for short than for longer exposures. The effect of pressure was comparable with that of time for short exposures, but less damaging for intervals beyond those at which small initial degradations occurred. The materials were scorched at 254.5°–141.5° for exposures from 2.4 and 30 sec., respectively, at the low pressures and 198°–132° for the same interval of exposure at the high pressures. This shows the effect of pressure to be six times as great for the short interval as for the long. After the first 5 sec. of exposure the rate of decrease of scorching temperatures was found to be less than 200°. Microphotographs of the scorched samples showed scorching to first affect the tips of the protruding fibers. The character of the deterioration was further evidenced by the fact that under constant pressure and time conditions small initial changes in reflectance occurred 70° lower than those in breaking strength. Fabrics ironed warpwise with the moving roll at 4 lb. pressure revealed a decrease of 1 or 2 threads to the inch in the filling count as compared with the count when the samples were passed through the ironer at 1.28 lb. pressure. With a filling decrease, an average increase of ½ thread was found for the warp. The thickness of the fabric decreased 4.5 percent. Microscopic observations confirmed this tendency toward displacement of filling yarns. With the still type of contact, the fabrics gave no evidence of displacement. Breaking strength tests showed a measurable change for the cool moving roll at pressures of 1.28 and 4.0 lb. at 321° and 286°, respectively. Corresponding values for the hot roll were obtained at 285° and 254°. For the still roll a continuous loss of strength was noted at 255° for all exposures up to 60 sec. at high pressure and from 5 to 60 sec. at low. An additional loss of 10 percent in strength was noted for samples having an initial reduction of 10 percent after the second ironing process. Tests on the elasticity of the fabrics showed that samples having a decrease in breaking strength of 42 percent had only a loss of stretch at break of 24 percent. Similar changes were noted for fluidity and breaking strength, though fluidity is more sensitive to small initial degradation. A decrease in methylene blue absorption was noted for all conditions of chemical change. The reduction in the copper number after an alkaline boil showed the oxidized cellulose to be of the reducing type, although with severe degradation there was evidence of the acidic type.

Severe scorching showed a greater relative change in reflectance in the red part of the spectrum than in the violet, and the solutions of cottons on which fluidity was determined became similar to truly viscous liquids. The moisture content of such damaged fabrics was considerably less than that of the undamaged fabric. Damage as indicated by the various tests was increased as much as 50 percent of the value when the padding of the roll was hard and unyielding, particularly at low pressure with both types of contact.

The three sheeting materials gave similar changes with the pressure and time-exposure treatments. One, however, designated as Strict Good Ordinary cotton was slightly more resistant to the damaging conditions than the other two representing Good Middling and Middling grades.

A study of children's wardrobes, M. PENNINGTON and I. H. GROSS (*Jour. Home Econ., 27 (1935), No. 10, pp. 647–649*).—Data were collected by the inventory method of interviewing the mothers of 71 families of East Lansing, Mich., who had children between 2 and 7 yr. of age and whose annual incomes ranged from $2,000 to $5,000. Information was obtained on the average number and content of garments found in the wardrobes of boys and girls, with costs at 1931 prices, the number of garments made in the home for girls and boys, and the number of garments handed down from other people.

HOME MANAGEMENT AND EQUIPMENT

A study of farm refrigeration methods, E. LATZKE and D. BERRIGAN (*North Dakota Sta. Bul. 286 (1935), pp. 72, 73*).—This progress report deals chiefly with the kerosene-operated refrigerators of the automatic continuous-burning and refueling types.

MISCELLANEOUS

Directory of field activities, compiled in the Office of Budget and Finance (*U. S. Dept. Agr., 1936, pp. 138; Sup. 1, p. 1*).—This is a geographical directory showing the field activities of the Department by the cities and towns at which employees are located in the States, Territories, possessions, and in foreign countries.

Report on the agricultural experiment stations, 1935, J. T. JARDINE, W. H. BEAL, ET AL. (*U. S. Dept. Agr., Off. Expt. Stas., Rpt. Agr. Expt. Stas., 1935, pp. 160*).—This report is discussed editorially on page 433.

Index to Department Bulletins Nos. 1–1500, M. G. HUNT (*U. S. Dept. Agr., 1936, pp. 384*).—This is a combined author and subject index.

Publications available for free distribution (*Idaho Sta. Circ. 75 (1936), pp. 4*).—A list of the station and extension publications available as of March 1936.

Annual report of the Massachusetts Agricultural Experiment Station, 1935, F. J. SILVERS ET AL. (*Massachusetts Sta. Bul. 327 (1936), pp. 84*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Agricultural research in New Hampshire: Annual report of director of New Hampshire Agricultural Experiment Station for the year 1935, J. C. KENDALL ET AL. (*New Hampshire Sta. Bul. 289 (1936), pp. 31*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. The text of the Bankhead-Jones Act (E. S. R., 73, p. 283) is included.

Experiment station progress: Report of North Dakota Agricultural Experiment Station for four years, July 1, 1931, to June 30, 1935, P. F. TROWBRIDGE ET AL. (*North Dakota Sta. Bul. 286 (1935), pp. 99, figs. 13*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Today's science for tomorrow's farming: Annual report of the director, [Wisconsin Station, 1935], compiled by N. CLARK and N. HOVELAND (*Wisconsin Sta. Bul. 435 (1936), pp. [2]+158+[3], figs. 32*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

Connecticut [New Haven] Station.—Dr. Donald F. Jones, head of the genetics department, has returned from a year's absence on a research project at the California Institute of Technology.

Hawaii Station.—A 30-acre tract within easy driving distance has been transferred to the station for use as a substation. Adequate electric power and water for irrigation are available.

New divisions in the station have been set up in horticulture, plant pathology, and parasitology. These divisions are headed, respectively, by Drs. J. H. Beaumont, George K. Parris, and Joseph E. Alicata.

Iowa College and Station.—A brooder house, 30 by 136 ft., is to be built at the poultry husbandry experimental farm. It is planned to insulate this building very carefully and to install an oil heating unit which will maintain a controlled temperature, remove impurities from the air, and provide controlled humidification. In the summer the building may be cooled somewhat by the circulation of air from this unit. The capacity of the house will be approximately 7,000 chicks up to a period of 5 weeks of age.

Dr. R. A. Fisher, Galton professor of the University of London, served during the summer as guest professor in a 6 weeks' series of lectures to the station staff on statistics. At the conclusion of the series he was awarded the D. Sc. degree by the college.

Louisiana Station.—Dr. L. O. Ellisor has been appointed assistant entomologist beginning September 1.

Missouri University.—Dr. C. E. Marshall of the University of Leeds has accepted an appointment as visiting professor in the department of soils for the coming year.

Montana College and Station.—Recent appointments include the following: Vincent E. Iverson, as assistant professor of horticulture and assistant horticulturist; Dr. A. H. Walker, as assistant animal husbandman, vice W. F. Dickson resigned; W. B. Nelson, as instructor in agronomy in the college and assistant agronomist in the station, vice L. P. Reitz resigned to accept a position with the U. S. D. A. Bureau of Plant Industry; Ralph E. McCall, as assistant professor of animal husbandry and assistant animal husbandman, vice Ross H. Miller resigned; and P. S. Eckert, as instructor in agricultural economics and assistant agricultural economist, vice O. L. Mimms resigned to accept a position with the University of Idaho. Frank Barnum, assistant in animal husbandry, has resigned to become a county agricultural agent. J. E. Norton, superintendent of the Judith Basin Substation, has resigned to take up farming and has been succeeded by J. L. Sutherland. George W. Morgan, superintendent of the Northern Montana Substation, has retired and has been succeeded by Martin A. Bell.

New York State Station.—Additional State appropriations have been granted of $10,000 for studies of apple scab and other fruit tree diseases and $5,000 for studies of diseases of hops.

South Dakota Station.—The resignations are noted of Jeanette E. Ross, research chemist in textiles, and R. E. Henderson, assistant in farm management, the latter to accept a position with the U. S. D. A. Soil Conservation Service in Missouri.

EXPERIMENT STATION RECORD

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EDITORIAL

THE UP-STREAM ENGINEERING CONFERENCE AND THE YOUNG MEN'S CONFERENCE "ON BEHALF OF A CONTINENT"

Following a suggestion by Secretary of Agriculture Henry A. Wallace, two novel conferences were held in Washington, D. C., from September 22 to 24, 1936. The first of these was a 2-day gathering, known as the Up-Stream Engineering Conference. This was followed and supplemented by a 1-day session of the Young Men's Conference "On Behalf of a Continent."

The objectives of the Up-Stream Engineering Conference were outlined by President Franklin D. Roosevelt in a letter of authorization of June 16, 1936. In this letter he pointed out that "upstream engineering will have a major part in efforts to save the land and control floods. . . . The objects . . . are through forestry and land management to keep water out of our streams, to control its action once in the stream, and generally to retard the journey of the raindrop to the sea." "There are indications that a substantial body of technical information on the control of little waters is now available in the scattered records of American experience—Federal, State, and professional. The urgent problem is to bring these data together in a coordinate body of engineering knowledge so that public officials and engineers may have a more definite picture of the upstream engineering as an important field of public and professional activity."

As a committee to organize and promote such a conference, President Roosevelt appointed Mr. Hugh H. Bennett, Chief of the U. S. D. A. Soil Conservation Service; Mr. Morris L. Cooke, Administrator of Rural Electrification Administration; and Dr. F. A. Silcox, Chief of the U. S. D. A. Forest Service. This committee was assisted by a general committee of 73, among whom were representatives of the various bureaus of the Department of Agriculture and other Federal agencies, many of the agricultural colleges and experiment stations, and others, while the cooperating agencies included not only these groups but such bodies as the Association of Land-Grant Colleges and Universities, The American Engineering

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Council, the American Society of Agricultural Engineering, the American Society of Agronomy, the American Forestry Association, the American Meteorological Society, the American Soil Survey Association, the National Grange, the American Farm Bureau Federation, and 35 others interested in one or more phases from a national or regional point of view.

The program dealt broadly with the fundamental principles and considerations of land use and water control. One session, presided over by President H. P. Baker of the Massachusetts State College, considered especially the management and use of lands for forestry, range, and agriculture. The main paper as to agricultural lands was given by Mr. Bennett, and the discussion was opened by Mr. Noble Clark, assistant director of the Wisconsin Experiment Station, who emphasized the human relationships involved and made a vigorous plea for the consistent and symmetrical development of research as an essential foundation and accompaniment of any campaign for erosion control.

Realizing that a program of upstream engineering will be one of long duration, the Young Men's Conference was arranged to interest the potential future leaders in the problems of soil and water conservation. In addition to discussions of the purpose of the conference by its chairman, Dr. H. A. Morgan of the Tennessee Valley Authority, and Hon. Maury Maverick of Texas, as well as by leaders of soils, forest, and engineering activities, a distinctive feature was the presentation of brief reports by representatives of the 4-H Clubs, the Future Farmers of America, the Junior Chamber of Commerce, and the National Grange.

The two conferences brought together several hundred representatives of the hitherto more or less isolated agencies which are interested in the problems involved, and thereby exerted a valuable unifying and coordinating influence. The sessions were also of considerable public interest and appeal, and from this point of view were timely and abundantly worth-while.

DR. MARK FRANCIS (1863–1936)

A PIONEER IN EXPERIMENT STATION RESEARCH IN VETERINARY MEDICINE

A necrological tribute to Dr. Mark Francis, whose death occurred on June 28, 1936, ascribes to the late President William Oxley Thompson of Ohio State University the statement that if that institution had trained no other man in its entire existence it would have given back to the people more than they had ever expended upon it. This statement was doubtless occasioned by the distinctive

contributions of this pioneer in veterinary education and research at the Texas College and Station for nearly half a century.

Born in Shandon, Ohio, in 1863, Dr. Francis was graduated in 1887 from Ohio State University as the first student to receive its degree in veterinary medicine. Subsequently he studied at the American Veterinary College in New York City, the University of Michigan, and in Germany.

Dr. Francis joined the staff of the Texas College in 1888 as professor of veterinary medicine, continuing in this capacity till 1916 when the work was organized as the School of Veterinary Medicine, of which he became and remained dean. He also began work in 1888 as veterinarian of the newly organized Texas Experiment Station, and since the death of the late Dr. R. R. Dinwiddie in Arkansas in 1929 he had had the distinction of the longest period of continuous service in charge of station veterinary work.

The earliest studies which he carried on were with the screwworm, on which he reported in 1890. They were soon extended to other parasites and diseases of livestock, including liver flukes, blind staggers, glanders, and infectious anemia of horses and hog cholera. The work for which he became most widely known, however, was done on Texas fever, or, as he termed it, southern cattle plague. This project was begun under what was probably the first formal interstation cooperative agreement, made in 1888 by the Texas and Missouri Experiment Stations, the latter represented mainly by Drs. Paul Paquin and J. W. Connaway.

The contribution of Dr. Francis to this outstanding problem of its day was mainly in two directions. He sought means of immunizing northern cattle against the disease, treating thousands of head with injections of fresh blood from immune southern cattle and reducing under favorable conditions the prevailing mortality of 50 to 80 percent to approximately 5 or 6 percent. He also built in 1892 a device to spray cattle to destroy the ticks transmitting the disease and tested many dips in connection with this treatment, suggesting the use of the crude mineral oil which was employed almost exclusively from 1903 to 1911.

Dr. Francis was honored on many occasions by stockmen, his colleagues, and the public generally. Miami University conferred upon him the LL. D. degree in 1929, and a building on the Texas campus, which houses a notable collection of fossils of prehistoric animal life which he assembled, is designated Francis Hall. Yet beyond all this, as President T. O. Walton of the college pointed out on his birthday celebration in 1935, "he has built an enduring monument for himself in the hearts of those who know him and have made contacts with him. His State, his nation, the peoples of all the world have profited notably by his life's work."

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Results of work in agricultural chemistry.—I, II, edited by F. HONCAMP; III, edited by F. ALTEN and M. TRÉNEL (*Ergebnisse der Agrikulturchemie. Berlin: Verlag Chem., 1929, vol. 1, pp. VII+281, figs. 38; 1930, vol. 2, pp. 196, figs. 54; 1934, vol. 3, pp. 156, figs.* [17]).—These three volumes constitute the first three reports of proceedings of the agricultural chemistry section of the German Chemical Society.

The contents of volume 1 are: Chemistry and agriculture, by A. Binz, the distribution and cycle of iodine and its significance with relation to agricultural soils, by R. Griessbach; iodine in plant nutrition, by F. Ströbele; the iodine problem in animal nutrition, by K. Scharrer; the working together of the elements potassium and sodium in plant growth, by K. Maiwald; the tillage and fertilizer treatment of soils, by F. Alten; chemical and biological objectives of present methods of handling stable manures, by G. Ruschmann; laws of the decomposition of proteins, by W. Wöhlbier; procedures, practical considerations, and results of phosphoric acid determinations in soils, by E. G. Doerell; the lime reserves of our soils, by W. U. Behrens; the determination of the degree of saturation of soils acording to the newer methods, by H. Kappen; electrodialysis and the problem of mineral soil acidity by M. Trénel; the measurement of soil reaction, influences altering soil reaction, and their biological evaluation for agricultural purposes, by J. Görbing and W. Adolphi; and experiences in the determination of the lime requirement and controlling the degree of saturation of agricultural soils, by E. Pfeil.

Volume 2 deals with the composition of soil solutions and the growth of plants in very dilute solutions, by M. v. Wrangell; the determination of the nutrient content of soils by means of biochemical methods, by H. Niklas; the significance of the condition of the soil with respect to lime and to acidity and its determination by electrometric titration, by S. Goy; the absorption and utilization of phosphoric acid by plants, by Kleberger; the phosphoric acid content of the soil and treatment with phosphated fertilizers, with reference especially to biological relations, by O. Engels; the fertilizer treatment of acid soils, by H. Kappen; on the suspension effect, by G. Wiegner and H. Pallmann; the fertilizer effect of the anions and of the other constituents of potassic fertilizers, by O. Eckstein; the changes of nitrogen in green plants, by G. Klein; some new and noteworthy commercial feeding stuffs and their practical importance, by M. Kling; and the combating of forest damage by means of dusting with "Meritol" and a motor-driven dust sprayer, by H. Schotte.

The contents of volume 3 are divided into four sections—problems of agricultural chemistry, soils and fertilizer treatment, animal nutrition, and agricultural technology. Section 1 contains agricultural chemistry in the new state, by H. Niklas; and section 2 contains the status of soil analysis and its value in agricultural improvement, by F. Alten; the practical cooperation of agricultural chemists in agricultural group research, by R. Thun; the con-

servation of the productivity of soils, by W. U. Behrens; the physiological significance of mineral soil acidity, by M. Trénel and F. Alten; the economic significance of systematic investigations of soil reaction, by L. Schmitt; and the effect of fertilizers on wheat quality, by C. Pfaff. The third section contains comparative investigations of the physiological effect of the continued consumption of food materials grown with and without the use of commercial fertilizers, by A. Scheunert; the significance of the mineral composition of fodders for animal feeding, by A. Jacob; what problems fall to the chemist in the enforcement of the feedstuffs law? by L. Seidler; and the status of the science of animal nutrition in Germany, by W. Wöhlbier. Section 4 discusses whether the preparation of sugars from wood is economically desirable in Germany, by Spengler; and the preparation of fodder yeast from wood sugar, by H. Claassen.

Gmelin's handbook of inorganic chemistry.—IV, Nitrogen, pts. 2, 3 (*Gmelins Handbuch der anorganischen Chemie. System-Nummer 4: Stickstoff. Lief. 2, 3. Berlin: Verlag Chem., 1935, 8. ed., No. 4, pt. 2, pp. X+N283–N506, figs. 32; 1936, 8. ed., No. 4, pt. 3, pp. XIX+N507–N854, figs. 54*).—These two parts of the eighth edition of this well-known reference work (E. S. R., 73, p. 436) deal with the compounds of nitrogen with hydrogen and with oxygen, respectively, each of these topics being systematically taken up under numerous subheads.

Occurrence of selenium in the Colorado River and some of its tributaries, K. T. Williams and H. G. Byers (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 6, pp. 431, 432*).—The upper parts of the Colorado and Gunnison Rivers were found to contain no selenium in excess of 1 part per billion, but showed increasing selenium content after receiving the drainage waters from seleniferous lands. It is noted in part, in this contribution from the U. S. Bureau of Chemistry and Soils, that "the source of the selenium in the drainage water is clearly evident through consideration of the data. . . . On the banks of the drainage ditches occur salt incrustations and these are in effect seepage deposits. They range in selenium content from 16 to 260 p. p. m. . . . These observations have a practical aspect aside from their scientific interest, in that they indicate clearly the possibility of improvement of seleniferous land by irrigation and drainage where such management is practicable."

Interfacial energy and the molecular structure of organic compounds.—III, The effect of organic structure on absorbability, E. R. Linner and R. A. Gortner (*Jour. Phys. Chem., 39 (1935), No. 1, pp. 35–67, figs. 13; abs. in Minnesota Sta. Rpt. 1935, pp. 27–29*).—The experiments here reported (E. S. R., 73, p. 740) were carried out at the Minnesota Experiment Station in order to elucidate the effect of substituent groups on adsorption. Adsorption studies were carried out with a series of structurally related compounds on a single and comparable substrate. For this study a large sample of decolorizing carbon, norite, was used. Members of the homologous series of fatty acids used were formic, acetic, propionic, butyric, valeric, caproic, and caprylic acids; members of the homologous series of dicarboxylic acids used were oxalic, malonic, succinic, glutaric, and adipic acids. To demonstrate the effect of various groupings in the molecules, compounds were chosen and adsorption studies made as follows: For the grouped chain, isobutyric, isovaleric, and methyl succinic acids; for the hydroxyl group, glycolic, lactic, glyceric, malic, and tartaric acids; for the carboxyl group, acids of the two homologous series listed above and citric acid; for aldehyde and keto groups, glyoxylic, pyruvic, and levulinic acids; for the double bond and variations due to cis- and trans-

isomers, fumaric, maleic, mesaconic, itaconic, and citraconic acids; and for halogen substitutions mono- and di-bromosuccinic acids.

Generalizations and conclusions drawn by means of various well-known physicochemical equations from the data obtained are also shown.

Electrokinetics.—XIV, A critical comparison of electrophoresis, streaming potential, and electrosmosis, H. B. BULL (*Jour. Phys. Chem., 39 (1935), No. 5, pp. 577–583, fig. 1; abs. in Minnesota Sta. Rpt. 1935, p. 24*).—This contribution from the Minnesota Experiment Station (E. S. R., 73, p. 740) describes a new electrophoretic cell and reports experiments in which the electrophoretic, electrosmotic, and streaming potential methods of measuring the electrokinetic potentials were compared, with the use of the same solution and surface. "Good agreement was found when dealing with protein-coated surfaces. Poor correspondence was found between electrophoresis and streaming potential for quartz and cellulose surfaces."

Electrokinetics.—XV, The use of inert electrodes in measuring the streaming potential, H. B. BULL (*Jour. Amer. Chem. Soc., 57 (1935), No. 2, pp. 259, 260, fig. 1; abs. in Minnesota Sta. Rpt. 1935, p. 34*).—Continuing this series, the author compared reversible electrodes with nonreversible gold electrodes in the measurement of the streaming potential. The gold electrodes were found to give excellent values.

Investigations on the electrophoresis of cholesterol suspensions [trans. title], L. S. MOYER (*Biochem. Ztschr., 273 (1934), No. 1–3, pp. 122–131, figs. 2; abs. in Minnesota Sta. Rpt. 1935, p. 36*).—The author of this contribution from the Minnesota Experiment Station finds that cholesterol sols, prepared according to the various methods in the literature, show wide divergences in electrokinetic properties, and that the poor agreement of previous workers is to be explained by variations in methods of preparation, not by impurities in the cholesterol. Curves showing the behavior of cholesterol sols prepared by grinding in ice are given, the electrophoretic mobility being plotted against pH. Such curves were found to follow a Langmuir adsorption isotherm and to be best explained by the assumption of an adsorption mechanism as the cause of the ζ-potential of cholesterol suspensions.

Electrophoresis of sterols.—II, Ergosterol, L. S. MOYER (*Jour. Gen. Physiol., 18 (1935), No. 5, pp. 749–753, fig. 1; abs. in Minnesota Sta. Rpt. 1935, p. 45*).—This contribution from the Minnesota Experiment Station, apparently an extension of the paper noted above, takes up the electrophoretic behavior of powdered ergosterol crystals, which was found to be identical with that previously found for cholesterol, within the limits of experimental error. Both sterols were found to have an isoelectric point at pH 3.1. Evidence for an adsorption hypothesis is presented to explain this phenomenon.

The dissimilation of pyruvic acid by Lactobacillus lycopersici, M. E. NELSON and C. H. WERKMAN (*Iowa State Col. Jour. Sci., 10 (1936), No. 2, pp. 141–144*).—Pyruvic acid was found to be fermented by *L. lycopersici* with the production of lactic, acetic, and carbonic acids in equimolecular quantities. One molecule of pyruvic acid undergoes oxidation to acetic and carbonic acids with the simultaneous reduction of a second molecule of pyruvic to lactic acid.

Preparation of white zein from yellow corn, I. D. MASON and L. S. PALMER (*Jour. Biol. Chem., 107 (1934), No. 1, pp. 131, 132; abs. in Minnesota Sta. Rpt. 1935, p. 37*).—Noting that it has not been possible previously to prepare a white zein from yellow corn, the authors of this contribution from the Minnesota Experiment Station report experiments in which a method was worked out whereby perfectly white, pure zein, the principal protein in corn, was prepared from yellow commercial corn gluten meal. The essential new features in the

method consisted in rendering the yellow alcoholic solution of the zein colorless by shaking it with ethylene dichloride in a separatory funnel.

The nature of the pigments of the gasoline extract of wheat, M. C. MARKLEY and C. H. BAILEY (*Cereal Chem., 12 (1935), No. 1, pp. 33–39, figs. 3; abs. in Minnesota Sta. Rpt. 1935, p. 26*).—By means of a modified method, elaborated at the Minnesota Experiment Station, for the separation of the carotenoid pigments by utilizing the differences in the solubilities of carotene and of xanthophyll in hydrocarbons and in aqueous alcohol, "it was found", according to the abstract, "that approximately 95 percent of the pigmentation of the gasoline extract of wheat was due to carotenoid pigments. These carotenoid pigments were found by spectral analysis to be carotene and xanthophyll with no lycopene present. Xanthophyll was found to be the predominating pigment, since it constituted from 65 to 87 percent of the total carotenoid pigments. A number of noncarotenoid pigments as yet unidentified were found in small quantities in the gasoline extract."

The pigments of the dilute alcohol or acetone extract of whole wheat meal, M. C. MARKLEY and C. H. BAILEY (*Cereal Chem., 12 (1935), No. 1, pp. 40–48, figs. 3; abs. in Minnesota Sta. Rpt. 1935, p. 29*).—It was found in an investigation carried out at the Minnesota Experiment Station that upon extracting ground wheat or flour with aqueous alcohol or acetone, extracts which had properties similar to those of the flavones which have been extracted from wheat leaves were obtained. According to the abstract, "these extracts have indicator properties, being pale yellow in neutral or acidic media and intense greenish or brownish yellow in alkaline media. The adsorption spectra of both the neutral and alkaline aqueous alcohol extract of durum wheat was determined in both the visible and the ultraviolet regions. These pigments were found in increasing amounts as the refinement of the flour decreased, indicating a possible location in the fibrous portions of the wheat berry. However, they appear to be distinct from the brownish pigment of the bran of 'red' wheats. Some dark-colored extracts were obtained from wheat by prolonged (2 yr.) extraction with alkaline media."

Determination of the carotenoid pigment concentration of small samples of whole wheat, M. C. MARKLEY and C. H. BAILEY (*Cereal Chem., 12 (1935), No. 1, pp. 49–53, fig. 1; abs. in Minnesota Sta. Rpt. 1935, p. 27*).—Adaptations of method devised at the Minnesota Experiment Station permitted an analysis of the pigments contained in the seed from a single plant of wheat.

According to the abstract, "by the use of special technic it was possible to determine the carotenoid pigment concentration of samples of wheat as small as 0.55 g. The errors in this determination were studied and from replicated tests were found to be represented by a coefficient of variability of 7. This indicates that the method would be sufficiently precise for use in inheritance studies involving the pigmentation of cereal grains."

Factors affecting the diastatic activity of wheat flour, [I], II (*Cereal Chem., 11 (1934), No. 5, pp. 515–522, fig. 1; 12 (1935), No. 3, pp. 268–275; abs. in Minnesota Sta. Rpt. 1935, pp. 23, 24, 34*).—This investigation was carried out at the Minnesota Experiment Station.

In the first paper, by M. C. Markley and C. H. Bailey, it was found "that the substitution of 16XX silk for 10XX silk on the patent sifter of an experimental mill, with the consequent reduction in particle size, increased the diastatic activity of the patent flour by 42 percent when the milling was done at moderate atmospheric humidities (50 percent), but when the relative humidity was increased to 75 percent the increase in diastatic activity due to the finer particle size was only 9 percent. This indicates that granulation is

probably not the principal factor, but that the condition of the surface of the starch granules is of major importance in determining the diastatic activity of a flour.

"The diastatic activity of flour is affected by the tempering of the wheat. When wheat was moistened with water and placed in a closed can for several days, the diastatic activity of the flour was much lower than when the dry wheat was exposed to humid air until the moisture content was appreciably increased. A short temper just prior to milling was of little effect.

"The environment under which the wheat was grown had an effect upon the diastatic activity of the resulting flour. Marquis wheat was found to yield flour 40 percent higher in certain localities than in others during the 1933 crop season. The variety of wheat was also found to be a factor in the diastatic activity of the finished flour. For example, Ceres wheat was found to be significantly higher in diastatic activity in the flour than was Marquis.

"The diastatic activity of flour was found to be correlated with the diastatic activity of the ground whole wheat. The magnitude of this correlation was affected by many factors, namely, varietal influences, environmental influences during the growing, harvesting, and storage of the wheat, and environmental influences involved in the milling technics used for producing both the white flour and the whole wheat meal."

The second paper, by W. R. Steller, M. C. Markley, and C. H. Bailey, gave the results of determining the relative diastatic activity of 19 samples of flour milled from blends of equal quantities of wheat grown during 1933 in the rod row nurseries at each of three locations in Minnesota, used in order to eliminate climatic and soil effects. Blended samples of patent flour, and with nearly the same reliability the blended wheat samples, were found to be as satisfactory a method for the determination of the relative diastatic activity of different wheat varieties as individual sample determinations, if sound, ungerminated wheat samples were used. It was noted that 70 percent of the sugar formed during a 60-min. digestion was converted during the first 15 min. and 83 percent during the first 30 min. Extending the digestion period for another half hour resulted in an average increase of only 9 percent over the first half hour. The digestion period could, therefore, be shortened to 30 min. without serious loss of accuracy. An abundance of saccharifying or beta-amylase was present in all samples. In the enzymic conversion of starch to sugar a limiting factor was found which was associated with starch and which was removed by prolonged dialysis.

Biochemical studies in the nitrogen metabolism of the apple fruit.—I, The estimation of amino-nitrogen by the Van Slyke method in presence of tannin, A. C. HULME (*Biochem. Jour., 29 (1935), No. 2, pp. 263–271, fig. 1*).—The abnormally high figures for the amino nitrogen content of apple fruits as obtained by the Van Slyke method were thought to be due to tannin. Experiments indicated that complete removal of small amounts of tannic acid added to apple extracts could be achieved by precipitation with potassium dichromate, and presumably any present in the extracts themselves is removed by this method, which is shown not to interfere with the amino or acid amide groups.

Based on the above result, a method is described whereby the interference of small amounts of tannin with the Van Slyke amino nitrogen determination is entirely overcome, and tentative suggestions are made for a new method of determining the tannin content of plant extracts.

The acid degradation of wool keratin, M. BARR and R. EDGAR (*Iowa State Col. Jour. Sci., 10 (1936), No. 2, pp. 129–134, figs. 2*).—The degradation of wool

keratin by from 0.25 to 7.87 N hydrochloric acid in 10 hr. at 25° C. and by from 0.25 to 0.75 N hydrochloric acid and from 0.06 to 0.70 N sodium chloride in 1 hr. at 100° was followed by means of determinations of the weight, nitrogen, sulfur, and wet breaking strength of the residual keratin. Acid degradation, much greater at 100° than at 25°, was shown to remove little of the sulfur of wool, to decrease its nitrogen approximately in proportion to its weight, "and to have a sensitive indicator in wet breaking strength." The residual wool was shown to decrease in nitrogen content and increase in sulfur content slowly with increasing concentration of acid.

The acid and alkaline degradation of chlorinated wool, F. and M. BARR and R. EDGAR (*Iowa State Col. Jour. Sci., 10 (1936), No. 2, pp. 145–150, figs. 3*).—At the Iowa Experiment Station the degradation of wool, chlorinated by 0.06 N hypochlorous acid in 1 hr. at 25° C., by from 0.5 to 6 N hypochloric acid in 10 hr. at 25°, from 0.25 to 0.75 N hydrochloric acid in 1 hr. at 100°, and from 0.05 to 0.2 N sodium hydroxide in 10 hr. at 40°, was followed by determining the weight, nitrogen, sulfur, and wet breaking strength of the residual wool.

"Degradation of chlorinated wool by acid in 10 hr. at 25° exceeded that of wool as measured by sulfur or wet strength. At 100° the loss in sulfur was greater than that in weight, nitrogen, or wet strength. Sodium hydroxide in 10 hr. at 40° dissolved the same amount of sulfur from chlorinated wool as from wool but decreased the nitrogen and weight of the chlorinated wool more. The wet strength of chlorinated wool was completely destroyed in 1 hr. at 40° by 0.05 N sodium hydroxide. The residual chlorinated wool has been shown to decrease in nitrogen and sulfur with increasing concentration of acid or alkali."

Effect of sulphur sprays on corrosion of prune cans, E. H. WIEGAND (*Canning Age, 17 (1936), No. 2, pp. 72–74, 89, 90, figs. 8*).—A contribution from the Oregon State College gives a semipopular outline of work in which for all types of tins the effect of sulfur spraying of the fruit in reducing the degree of vacuum in the tins was greatest in the case of thiosulfates. Sulfites and elementary sulfur showed a less marked effect. The type of container also affected the results.

An improved liquid absorption tube, W. D. TURNER (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 6, p. 444, fig. 1*).—This new unit "consists of the solid absorption tube, to which has been added the familiar Friedrichs gas absorption principle, in the form of a helical coil. This unit possesses all the advantages of the original dry absorber, besides offering a contact path of some 42 cm in length between the gas bubbles and the liquid absorbing medium." Further advantages of the apparatus are enumerated. A dimensioned constructional diagram accompanies the note.

Improvements in design of pressure control assembly, S. PALKIN (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 6, p. 436, fig. 1*).—In a contribution from the Bureau of Chemistry and Soils, U. S. D. A., the author describes and illustrates an assembly in which pressure control is simplified with respect to manipulative detail by placing parts of the operation under automatic control.

A precision oil gage, S. PALKIN (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 6, pp. 434, 435, fig. 1*).—Of the apparatus described in this contribution from the Bureau of Chemistry and Soils, U. S. D. A., the author states in part that "the gage is in effect a double U-tube type manometer in which both oil and mercury are employed, the latter serving, however, only as a mobile 'backing' medium for the oil column." Pressure changes of 0.033 mm of mercury could be read accurately.

Continuous production of distilled water free from carbon dioxide and ammonia, F. G. STRAUB (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 6,*

pp. 433, 434, figs. 2).—A brief contribution from the University of Illinois describes various stages of experimentation whereby a still yielding a distillate from tap water of a specific conductance of 5×10^{-6} reciprocal ohms was made to yield 9 l per hour of a distillate the pH value of which was 6.8 and the specific conductance 0.3×10^{-6} reciprocal ohms. A small quantity of a dilute solution of sulfuric acid and sodium chromate was added continuously with the main feed of condensed steam, and air, free from carbon dioxide and ammonia, was blown through the still.

The determination of soil moisture by means of the carbide method [trans. title], W. Sibirsky (*3 Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 10–13*).—The author describes an apparatus which consists mainly of an ebonite cylinder containing an inner aluminum cylinder and closed by a cone-shaped cap in which a perforated ebonite plate covered by a disk of blotting paper supports a charge of calcium carbide sufficient to prevent any loss of moisture with the gas leaving the apparatus. The conical cap is provided with an exit tube closed by a Bunsen valve which is in turn protected against mechanical damage by a cap. The aluminum cylinder contains two steel balls. Powdered carbide is placed in the bottom of the aluminum cylinder in a quantity amounting to about three times the weight of the sample, and the apparatus is closed and weighed. The soil sample is placed upon a part provided for that purpose at the top of the aluminum cylinder, and the apparatus is again closed, weighed (to an accuracy of about 0.02 g), the apparatus is shaken for 5 min. by hand or by machine, it is again weighed, and the difference in weight, multiplied by the factor 1.47, is taken as the moisture content of the sample.

The author considers that, in view of the rapid oxidation of soil organic matter at 105° C. and the appreciable oxidation occurring at temperatures even as low as 50°, the carbide method gives the more dependable results.

Is the alcohol method for determining the water content in soils reliable? L. C. Smolík (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 13, 14*).—In comparisons involving several hundred determinations, the author found a considerable number of samples giving results by the alcohol method very different from those given by the ordinary procedure, so that he concluded that "the alcohol method cannot be looked upon as reliable." He points out that "it is also very interesting that this difference is not correlated with the nature of the horizons of soil types or with the amount of organic matter.

"Out of 813 determinations [arithmetical means of 2 or 3 analyses], 38, i. e., about 5 percent, showed difference up to 28 relative percent—in some cases the alcohol method gave higher, in the other cases lower results than the ordinary method. Out of 813 samples, 10 soils gave more water by alcohol than by oven drying."

Determination of the phosphate and potash needs of soils by chemical analysis, E. Truog and L. A. Dean (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 106–108*).—A brief discussion contributed from the University of Wisconsin calls attention to the fact that "a terminology which divides the soil phosphorus into an available portion and an unavailable portion is neither logical nor conducive to clear thinking", since all forms of soil phosphorus have an appreciable degree of availability to plants. It is suggested that it would be better to call that portion which can be dissolved easily by a single extraction with a weak solvent as being readily available, and that portion which continues to be dissolved by successive extractions as being slowly available. Also, "in setting up the minimum

levels of adequacy of readily available plant nutrients it should always be recognized that these are influenced by many factors. First, there is the crop factor—as it [is] generally known, certain crops require higher levels, especially of certain nutrients; crops having a very long growing period like sugarcane may make a satisfactory growth when forced to feed entirely on slowly available phosphate, while, under the same conditions, maize in northern United States and wheat in Canada might not make a satisfactory growth. Second, there is the climatic and seasonal factor—the shorter and colder the growing season the higher is the level needed for most nutrients; also a high proportion of cloudy weather during the growing season tends to raise the level of readily available potash needed. There is also a subsoil factor—while most agricultural plants feed largely in the plowed surface layer, deep rooted plants like alfalfa and sweetclover are able to feed vigorously to a depth of 4 or 5 ft. (1.2–1.5 m), and hence the subsoil must be given consideration in certain cases. And, finally, there is the economic factor—when land and agricultural products are high in price, it is profitable to farm at higher levels of readily available plant nutrients than when the reverse is true."

The simultaneous estimation of active chemical factors in plant nutrition through tests of a sodium acetate-acetic acid soil extract, M. F. MORGAN *(3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 103–105).*—This contribution from the Connecticut [New Haven] Experiment Station presents in condensed outline the methods for determining important soil constituents in solutions obtained by means of the author's Universal soil extracting solution and series of colorimetric and turbidimetric estimations (E. S. R., 67, p. 105). Attention is directed to the fact that "in most cases only one drop of a reagent of suitable concentration is sufficient to produce a readable test within 1 or 2 min. Using the above technic it is possible for one operator to make the entire series of tests on as many as 72 soils in a working day."

Report on vitamin A: Determinations with the Hilger vitameter, F. W. IRISH *(Jour. Assoc. Off. Agr. Chem., 19 (1936), No. 2, pp. 244–248).*—The Hilger vitameter is a modified spectrophotometer designed to measure the amount of absorption of ultraviolet light of the wave length of 3,280 a. u. The mechanism of the instrument is described. The amount of absorption at this wave length has been used to measure the potency of vitamin A concentrates, as noted previously (E. S. R., 60, p. 689). To check the procedure and calculations proposed by the instrument maker, 8 collaborators determined the units of vitamin A in 5 samples of cod-liver oil of known potency by strict compliance with the specified manipulations and calculations, by modifications introduced by the collaborator, and by calibration of the vitameter against U. S. Pharmacopoeia reference cod-liver oil. Results obtained from the use of this instrument by the different collaborators deviated considerably from the average for each oil and were not sufficiently concordant to warrant its immediate recommendation as an Official method.

Studies of crystalline vitamin B_1, II, III *(Jour. Amer. Chem. Soc., 57 (1935), No. 3, pp. 517–520, figs. 2; 536, 537).*—The scope of the work recorded in the first paper of this series (E. S. R., 73, p. 437) is extended.

II. *Elementary composition and ultraviolet absorption,* O. Wintersteiner, R. R. Williams, and A. E. Ruehle.—The authors show results in the carbon determination considerably higher than those obtained by others—average 42.75 percent. They point out the considerable difficulty encountered in securing consistent nitrogen determinations, giving 16.26 percent as their average figure. Their

average percentage of hydrogen being 5.35, of sulfur 9.51, and of chlorine 20 88, they find their results to agree best with the formula $C_{12}H_{16}ON_4S\ 2HCl$ for the hydrochloride analyzed (the theoretical percentages being C 42.71, H 5.38, N. 16.62, S. 9.51, and Cl 21.03).

Ultraviolet absorption was found to occur in two bands, at 235 mμ and at 267 mμ, respectively.

III. *Cleavage of vitamin with sulfite*, R. R. Williams, R. E. Waterman, J. C. Keresztesy, and E. R. Buchman.—"Vitamin B_1 is split quantitatively at room temperature by sulfite at pH 5 into two products having the compositions $C_6H_8N_2SO_3$ (I) and C_6H_8NSO (II), respectively. I is a sparingly double acidic product. II is a chloroform soluble base which has been isolated in the form of a crystalline hydrochloride."

An enzymic method for the estimation of true vitamin C, H. Tauber and I. S. Kleiner (*Jour. Biol. Chem., 110 (1935), No. 3, pp. 559–563*).—The authors devised a method for estimating true vitamin C content by determining the reducing power by indophenol titration of a food extract before and after the action of the specific ascorbic acid oxidase isolated by them (E. S. R., 74, p. 442) The technic was applied to oranges, lemons, tangerines, grapefruit, beer, tea, and milk. Certain tissue extracts containing interfering substances were purified with mercuric acetate. The oxidase was prepared by extracting the edible portion of Hubbard or summer squash with 30 percent alcohol.

The interfering action of glutathione in the silver nitrate test for ascorbic acid, J. L. Svirbely (*Biochem. Jour., 29 (1935), No. 7, pp. 1547–1551*).—Experimental results are reported indicating that the silver nitrate reduction test for ascorbic acid depends upon the relative amounts of glutathione and ascorbic acid associated with one another in certain animal organs or extracts and the pH of the silver nitrate. The color ranged in an alkaline medium from yellow to brown to black, depending on the concentrations of the two substances. Failure of the test did not indicate lack of ascorbic acid, but that the content was too low in comparison to glutathione to give a positive reaction. The test was found to be better for qualitative than quantitative analysis.

Reductions of pure ascorbic acid solutions were made in test tubes with acid and alkaline silver nitrate solutions. This method was sensitive to 0.003 mg ascorbic acid in the alkaline solution. It required 0.3 mg ascorbic acid to reduce the acid silver nitrate, pH about 3, in 45 min.

Gold sols formed immediately when ascorbic acid was added to gold chloride without applying heat. The color ranged from purplish-red to deep blood-red, depending upon the amount of ascorbic acid present. The addition of glutathione or cystine to the gold chloride caused the yellow color to disappear, indicating that stable salts formed which prevented the reduction of ascorbic acid. The formation of sols was sensitive to 0.045 mg ascorbic acid.

Determination of reduced ascorbic acid in small amounts of blood, C. J. Farmer and A. F. Abt (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 2, pp. 146–150, fig. 1*).—A micromethod for determining reduced ascorbic acid in small amounts of blood is described. A 0.3-cc sample of blood is deproteinized with metaphosphoric acid solution. The reduced ascorbic acid in the plasma is then titrated with a standardized solution of sodium 2,6-dichlorobenzenoneindophenol. The apparatus used for the determination is described and illustrated.

This method, because of the minute amount of blood required, is recommended in preference to the one previously described (E. S. R., 74, p. 135) in working with infants and in making repeated observations on the same individual.

Determination of chlorine in organic compounds.—I, A rapid lamp method, W. M. MALISOFF (*Indus. and Engin. Chem., Analyt. Ed., 7 (1935), No. 6, p. 428*).—In this method the organic compound is dissolved in a combustible solvent in various concentrations, preferably to produce from 0.2 to 0.3 percent chlorine, and is burned in the standard sulfur lamp following the precautions officially recommended by the American Society for Testing Materials. The titrations are made with precisely the reagents specified by the method with the same indicator. About 1 g of solution is burned. The standard calculation may be used and a correction applied, 1 percent of sulfur being equivalent to 2.216 percent of chlorine.

"The choice of a hydrocarbon solvent should fall on a petroleum fraction relatively free of sulfur and somewhat lighter than gasoline. The material used in this investigation contained 0.018 percent sulfur. . . . The lamp method operates best in solutions less concentrated than 0.5 percent, preferably at the 0.1- to 0.3-percent level, where the determinations are good to 2 to 3 percent. Therefore, since burning about 1 g suffices, a determination can be carried out with only a few milligrams of a substance."

Determination of acetylmethylcarbinol in fermentation liquors, G. L. STAHLY and C. H. WERKMAN (*Iowa State Col. Jour. Sci., 10 (1936), No. 2, pp. 205–211*).—At the Iowa Experiment Station commercial acetylmethylcarbinol was purified by washing with anhydrous diethyl ether and filtering; 1 mol of acetylmethylcarbinol, when subjected to oxidation with $K_2Cr_2O_7+H_3PO_4$ yielded 2 mols of acetic acid; in the periodate oxidation for 2,3-butylene glycol, 1 mol of the carbinol formed 1 mol of acetaldehyde; and acetylmethylcarbinol reduced the Fehling solution, for which reason, in a reducing sugar determination, the cuprous oxide precipitated by the carbinol must be subtracted from the total cuprous oxide to obtain that due to the sugar.

Preliminary observations on the mellowing and stabilization of wine, M. A. JOSLYN (*Fruit Prod. Jour. and Amer. Vinegar Indus., 15 (1935), No. 1, pp. 10–12, 24*).—This contribution from the University of California deals with the following topics: Clarification and stabilization of wines by freezing, rapid aging, or "mellowing"—preliminary observations on the nature of the changes involved, preliminary tests with dry wines, comparison of the effectiveness of oak extract, role of acetaldehyde and peroxide oxidation, and preliminary tests on aging sherry.

Studies on the alkaline pulping processes, S. I. ARONOVSKY (*Paper Indus., 16 (1934), No. 6, pp. 413–419*).—This is a summary of the author's series of papers on the cooking process (E. S. R., 73, p. 743), bringing together in the eight tables accompanying the present paper the principal results of the studies on various pulping reagents and outlining the methods used in the experiments on sodium sulfate, sulfite, thiosulfate, sulfide, bromide, phosphate, carbonate, and hydroxide.

AGRICULTURAL METEOROLOGY

Report of the Chief of the Weather Bureau, 1934–35 (*U. S. Dept. Agr., Weather Bur. Rpt. 1935, pp. III+161, pls. 4*).—This report, like previous reports (E. S. R., 73, p. 155), gives a brief administrative review of activities of the Weather Bureau during the year, a general summary of weather conditions of each month of 1934, brief summaries of data regarding tornadoes, hail, losses from windstorms, sunshine, and excessive rainfall during the year, and detailed tabulations of data for pressure, temperature, precipitation, humidity, cloudiness, wind, and evaporation throughout the United States.

Comparing the weather of 1935 with that of 1934, the report says: "The severe and unprecedented drought of 1934, which seriously affected agriculture in the United States, did not carry over to an appreciable extent into the 1935 crop-growing season. Following the extremely hot, dry summer of last year, the fall months brought timely rains which produced soil moisture sufficient to permit the seeding and to promote the early growth of winter grains in practically all sections from the Great Plains eastward, except in the southwestern plains where moisture continued insufficient. In the western mountains, the winter months had much heavier snowfall than during the preceding winter, assuring a better water supply for irrigation than was available for the summer of 1934. Thus, except in the southwestern plains, the crop-growing season of 1935 began under much more favorable conditions than that of 1934."

Report of the Chief of the Weather Bureau, 1935, W. R. GREGG (U. S. *Dept. Agr., Weather Bur. Rpt. 1935, pp. 13*).—This is a brief administrative account of the work of the Weather Bureau during the fiscal year ended June 30, 1935, dealing briefly with cooperation with other nations, departments, and bureaus in meteorological service; weather conditions in 1935 as compared with 1934; air-mass analysis and its practical applications; airplane observations and their use in forecasting; reorganization of activities at airport stations and in the airway service; reorganization of the hurricane-warning service; improvements in flood forecasting; work in marine meteorology; and the fire-weather service.

Monthly Weather Review, [March–April 1936] (*U. S. Mo. Weather Rev., 64 (1936), Nos. 3, pp. 69–103, pls. 14, figs. 20; 4, pp. 105–158, pls. 10, figs. 20*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 3.—Determination of Altitudes from the Adiabatic Chart and the Refsdal Aerogram, by P. J. Kiefer (pp. 69–71); Variability Isocrymal Maps for the Great Plains, by E. E. Lackey (pp. 71–76); Intercorrelations between Climatic Variables in the Corn Belt, by J. K. Rose (pp. 76–82) (see below); An Observation of Unusual Ice Crystals, by C. R. Elford (p. 83); Monthly Temperatures, 1925–35, at the Montezuma Station of the Smithsonian Institution, by C. P. Butler (p. 83); Erratum in the Smithsonian Meteorological Tables: Temperature Correction Factor in the Hypsometric Formula (English Measures), by V. E. Jakl (pp. 84, 85); Composition and Origin of Dust in the Fall of Brown Snow, New Hampshire and Vermont, February 24, 1936, by W. O. Robinson (p. 86); Meteorological History of the Brown Snowfall of February 1936, by H. R. Byers (pp. 86, 87); and Duststorms of February and March 1936 in the United States, by R. J. Martin (pp. 87, 88).

No. 4.—On the Relation between Rainfall and Stream Flow—II, by R. T. Zoch (pp. 105–121); Cooling in the Lower Atmosphere and the Structure of Polar Continental Air, by H. Wexler (pp. 122–136); and Duststorms in the United States, April 1936, by R. J. Martin (p. 137).

Meteorological tables, D. A. SEELEY, A. E. WHITE, and H. M. WILLS (*Mich. State Bd. Agr., Ann. Rpt. Sec., 74 (1935), pp. 137–150*).—Data corresponding to those previously noted (E. S. R., 73, p. 444) are reported for the year ended June 30, 1935.

Intercorrelations between climatic variables in the Corn Belt, J. K. ROSE (*U. S. Mo. Weather Rev., 64 (1936), No. 3, pp. 76–82, figs. 7*).—A study is reported which "reveals that rainfall and accumulated temperatures, of the same month and of successive months, correlate to significant extents in parts of the Ameri-

can Corn Belt; and moreover, that the distribution of the areas of significant correlation reveals problems which invite further research that may yield highly important results."

Influence of annual temperature variation on precipitation and the weather [trans. title], L. LYSGAARD (*Met. Ztschr. [Braunschweig], 53 (1936), No. 3, p. 108*).—This article discusses briefly and attempts to evaluate the relation in Denmark of rising temperature and diminishing rainfall in spring and summer to falling temperature and increasing rainfall in autumn.

Origin of warm waves [trans. title], E. DINIES (*Met. Ztschr. [Braunschweig], 53 (1936), No. 3, pp. 81–84, figs. 4*).—It is indicated that winter warm waves in Middle Europe have their origin in highs in the Azores and on the American Pacific coast.

Soil temperatures at Bozeman, Montana, during sub-zero weather, G. A. MAIL (*Science, 83 (1936), No. 2163, p. 574*).—During a period, beginning January 25, 1936, of the coldest and most extended sub-zero weather ever recorded at Bozeman, Mont., the frost line reached 3 ft. in the soil and remained there 23 days. The minimum temperature at the surface of the soil, which was covered with 8 to 15 in. of snow, was —7° C., while the minimum air temperature was —41.7°, thus showing the great insulating effect of snow cover.

Droughts of 1930–34, J. C. HOYT (*U. S. Geol. Survey, Water-Supply Paper 680 (1936), pp. VII+106, pl. 1, figs. 69*).—This report is based on information collected by various Federal and State agencies. It summarizes "some of the more outstanding questions related to droughts, both physical and economic. It outlines the nature and extent of the droughts of 1930–34; compares them with past dry periods in terms of precipitation, run-off, ground water, evaporation, and transpiration; and sketches the effects of droughts on water supplies as related to a variety of human purposes, including agriculture, domestic and industrial uses, health, power, navigation, and recreation and wild life; it also touches upon the relief, political, and economic elements."

It is stated that while nothing can be done to modify the occurrence of droughts, "the economic losses resulting from shortages of water caused by droughts relate to activities that man can control, and it is possible for man to do much toward the alleviation of such losses by the conservation of available water supplies by storage, by efficiency in all uses of water, and by the adjustment of activities that depend upon water to available supplies and to variations in supplies."

SOILS—FERTILIZERS

[Soil and fertilizer studies by the Florida Station] (*Florida Sta. Rpt. 1935, pp. 61, 62, 63, 112–114, 114, 115, 126–128*).—Data are given on the effect of green manures on the composition of the soil, soil moisture studies in relationship to cover crops, and phytometer studies on the comparative rate of decomposition of *Crotalaria striata, C. spectabilis,* and *C. intermedia,* all by R. M. Barnette; the behavior of zinc in soils, by H. W. Jones; the effect of water control on peat and muck soils, by R. V. Allison and B. S. Clayton; the role of copper, manganese, and zinc in peat and muck soils of the Everglades, by Allison, J. R. Neller, and R. E. Robertson; and phosphorus requirements of sugarcane and various grasses on Everglades soils, composition of subsurface waters, chlorine and nitrogen content of soils, oxidation, and effects of green manures, all by Neller.

[Soil and fertilizer investigations by the Idaho Station] (*Idaho Sta. Bul. 220 (1936), pp. 8, 9, 49*).—Brief notes are given on the use of gypsum for the

amelioration of slick spots in soils, potash and nitrogen content of soils from new areas in the State, and rock phosphate v. superphosphate in southern Idaho.

[Soil and fertilizer studies by the Michigan Station], C. S. BRYAN and C. E. MILLER (*Michigan Sta. Rpt. 1935, pp. 180, 235, 236*).—Notes are given on the reproduction of soil bacteria in soils stored at 25° and 7° C., treatment of muck soils with sulfur and salt, fertilizer trials on soils in the Upper and Lower Peninsulas, the phosphorus content of alfalfa, and the unproductiveness of subsoils.

[Soil and fertilizer studies by the New Jersey Stations] (*New Jersey Stas. Rpt. 1935, pp. 85–88*).—Results are briefly noted on studies of availability of nitrogenous fertilizers; lime and soil improvement investigations; phosphorus content of New Jersey soils and its availability; lysimeter, base exchange, and soil profile studies; and the mechanism of humus formation.

Soil sampling tubes for shallow depths, F. HEYWARD (*Soil Sci., 41 (1936), No. 5, pp. 357–360, fig. 1*).—Fully dimensioned working drawings, descriptions, and directions for use are given for three distinct types of sampling tubes designed at the U. S. D. A. Southern Forest Experiment Station. The first of these devices is a tube for collecting samples for moisture determination of the 0- to 7-in. soil depth, the second is a tube for collecting a large number of cores in undisturbed field condition from the 0- to 6-in. soil depth of a size large enough to grow tree seedlings, and the third is a tube for obtaining a large number of samples of constant volume from the 0- to 3-in. soil depth.

A direct method of aggregate analysis of soils and a study of the physical nature of erosion losses, R. E. YODER (*Jour. Amer. Soc. Agron., 28 (1936), No. 5, pp. 337–351, figs. 5*).—The "inherent weaknesses" of the elutriation method of aggregate analysis are pointed out, and the use of this method of aggregate analysis is questioned; a mechanism is devised to account for the slaking reaction of soils in the presence of excess water; and a method and apparatus for determining the water-stable aggregate distribution in soils are reported.

"Several soils of the Cecil series with widely varying clay contents were found to have similar distribution of water-stable aggregates. Soils from different series were found to be characterized by different distributions of water-stable aggregates."

The physical nature of the erosion process was studied on controlled field plats of Cecil clay located on several slopes. The losses from this "strongly aggregated" soil were found to occur primarily in the form of water-stable aggregates.

Data presented to show the effectiveness of winter legumes in controlling sheet-erosion losses are included, and the manner in which this type of "vegetative control" functions is reviewed. Results of the use of various widths of strip crop for controlling sheet erosion are presented. "The basic weakness of this type of vegetative control practice" is pointed out.

Field textures and physical composition determined by two methods of mechanical analysis, C. F. SHAW (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 42–46, fig. 1*).—In an investigation carried out at the University of California, using as the two mechanical analysis procedures the ammonia-centrifuge method and a modification of the International method, 64 samples of surface soils from the Lodi and Napa soil survey areas, which had been surveyed by the same two men, working together, were analyzed. To make the comparisons direct, the upper limit of the silt fraction was held at 50μ and of the clay at 5μ in both methods.

From these studies it became apparent that from the standpoint of mechanical analysis the field men were inclined to name the soils of intermediate tex-

tures in one grade too coarse, light clay loams being judged as loams and light clays as clay loams. None of the so-called clay loams, however, fell far outside the clay loam portion of the triangular diagram, whereas several of the loams were well away from the loam section. The clays and sandy loams were consistently named. This "drift" in the judgment of textures appears to be due to a tendency to make the determination comparative. "When working in a region of dominantly heavy soils, the sandier soils are often named in a textural grade that is too light or coarse, whereas in a region of dominantly sandy soils many soils of finer texture are often designated by a grade heavier or finer than their composition would warrant."

Of the dispersion methods used it is noted that "field texture expresses not the actual or ultimate texture of the soil but rather a combination of texture and of the structure or degree of aggregation. The International method in its fundamental purpose aims to break down all structural aggregates and to resolve the soil into its individual particles. Since the structure of the soil depends to a considerable extent upon its chemical composition and on its exchangeable base status, the field texture cannot be expected to be directly reflected by the ultimate texture. Methods of mechanical analysis that are not sufficiently drastic to break down all of the aggregates but which resolve only the less stable aggregates into their ultimate particles will give a better measure of the mechanical composition of the field grades. It is very doubtful if mechanical analysis by the International method will permit an interpretation of textural grades on the basis of a triangular diagram or even in a three-dimensional figure.

"The drift of the analyses . . . would also indicate the grave difficulty in endeavoring to adjust mechanical analysis by the International method with the standards established by the ammonia-centrifuge method. . . . The marked difference in dispersion due to the use of ammonia in one method and the use of a sodium compound following severe pretreatment in the other makes such conversions of results thoroughly unsatisfactory. If a standardization of field texture is to be accomplished by means of the International method, it can only be done by accumulating several thousand analyses of soils whose textural grade has been determined in the field by men working in close cooperation and who have maintained consistent standards for their grade separations. In view of the tendency to drift toward lighter or heavier designations, as shown by the two men working in California, both of whom had years of experience in the field, consistence in textural designations can only be maintained by frequently checking textural judgment by comparing field samples with soils that have been selected as textural standards or by means of mechanical analyses that follow the method of dispersion by use of ammonia without pretreatment, by which the first textural standardizations were established."

Chemical composition of the colloids of the great soil groups, H. G. BYERS (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 76–79*).—In a contribution from the U. S. D. A. Bureau of Chemistry and Soils, the author points out that "in each group a representative soil series contains colloid material characteristic of the series and also of the great group to which the series belong. These characteristics may be brought into high relief by using the analytical data in the form of ratios calculated to express the relative chemical units of the analytical components, pseudo or real. The units used are for the most part the normal oxides of the elements silicon, aluminum, iron, calcium, magnesium, potassium, sodium, and hydrogen," and he gives some silica : sesquioxide, silica : alumina, and silica : total base ratios, together with

relative base-exchange capacities and combined water contents, in illustration of this point. He further notes that with increased data it becomes more and more apparent that "the colloids of each great group are characterized by the presence of a definite complex, or complexes, which are dissimilar in the different groups and essentially alike in each great group. Hence the existence in the field of these great groups." A hypothetical view of the nature of the process of soil genesis is developed on this basis.

Studies on Podzols and Brown forest soils, III, K. LUNDBLAD (*Soil Sci., 41 (1936), No. 5, pp. 383–394, figs. 3*).—The Podsol and Brown forest soil profiles previously dealt with (E. S. R., 75, p. 306) were investigated with respect to their capacity for dye absorption, experiments with artificial aluminosilicates showing that the dye adsorption is comparable to the ion adsorption of colloids.

"The adsorption of acid and basic dyes is a promising method for a rapid and conclusive investigation of the colloidal properties of a soil. . . .

"Methods such as those used in the three parts of this paper will permit a rapid and conclusive comparative study of the soil-forming processes in different soil regions. Acid oxalate determinations of the reactive part of the colloids or the easy methods of investigating the amphoteric properties of the soil colloids—especially determinations of the ultimate pH, the pH of exchange neutrality, the combining capacity at different pH values, and the adsorption of acid and basic dyes—are very valuable in comparative studies where many analyses are necessary. For a thorough knowledge of the soils total chemical analyses are necessary; for many purposes, however, they may be confined to a few type specimens of the soils and the comparative study made with the easy and rapid methods here applied."

Tensiometers for measuring the capillary tension of soil water, L. A. RICHARDS and W. GARDNER (*Jour. Amer. Soc. Agron., 28 (1936), No. 5, pp. 352–358, figs. 3*).—Presented as a contribution from the Iowa and Utah Experiment Stations, a part of the work here recorded was carried out at Cornell University.

"The expression 'capillary tension' is used as a name for the negative pressure existing in the water in unsaturated soil, and porous cell-vacuum gage instruments used in its measurement are called tensiometers."

Principles underlying the use of indicating, recording, and differential tensiometers are discussed, and apparatus used by the authors is described.

The establishment of moisture equilibrium in soil, F. SHREVE and W. V. TURNAGE (*Soil Sci., 41 (1936), No. 5, pp. 351–355*).—In an investigation carried out by the Carnegie Institution of Washington at its Desert Laboratory at Tucson, Ariz., layers of soil of known moisture content were firmly tamped into large cans, two or three layers in each can, with differences of 5 or 10 percent between the contiguous layers. The soil, an alluvial clay or "adobe", with a water-holding capacity of 33.2 percent, was sampled in alternate months for 1 yr. and again at the end of the second year. In one of the four cans there was an approximation to equilibrium at the end of the second year, the extreme range of the readings being from 11.8 to 13 percent. In the other three cans a uniform distribution of moisture through the two or three layers was not attained.

"The change in distribution of the moisture during the first 2 mo. was greater than the total of all change in the subsequent 22 mo. in all cases but one. In some of the changes there is evidence of the influence of gravity. The individual layers of soil in a few cases showed the influence of an adjacent layer in the samples taken nearest it and a weaker influence in the sample or samples taken farther from it.

"The evidence of these results, and of those obtained in previous work on the natural moisture changes of soil in place, indicates that the movement at the low percentages prevailing in desert soils is very small, at least in heavy soils. The only rapid changes in moisture content are the increases due to heavy rainfall and the decreases at the surface by evaporation or at lower levels by root absorption. When low moisture contents are concerned and small differences of content are involved, the action of capillarity in the slow distribution of water through the soil and in the establishment of moisture equilibrium is of little importance."

The relation of crystal structure to base exchange and its bearing on base exchange in soils, W. P. KELLEY and H. JENNY (*Soil Sci., 41 (1936), No. 5, pp. 367–382, figs. 2*).—In a joint contribution from the Universities of California and Missouri the authors discuss conditions essential to ion exchange and present the results of experimental work on feldspars; zeolites and permutites; micas; talc; chlorites, pyroxenes, and amphiboles; pyrophyllite and kaolinite; bentonites and soil colloids; and on the exchange power of bentonites and soil colloids. They then take up the nature and strength of attraction forces and discuss other phases of the relation between crystal structure and base exchange. In part, their conclusions are that "it is highly probable that soil clays embrace a complex series of isomorphous minerals and that certain soils contain one general type of clay mineral, whereas other soils contain a second or a third type. The type actually predominating in a given mature soil would be expected to be that which is most stable under the conditions prevailing in that soil. On the other hand, it seems reasonable to suppose that immature soils might contain variable mixtures of clay minerals. At any rate, all of these clay minerals have more or less base-exchange power. It follows, then, that no one single substance is responsible for base exchange in all soils." Again pointing out that they "consider the views developed in this paper to be essentially tentative", the authors express the belief that "the OH of the lattice of clay minerals is an important source of their potential cation-exchange power, but it does not follow that the OH group is the sole cause of their exchange power. Should further investigation definitely establish that Al replaces Si in the clay minerals, and also that Mg replaces more or less Al, the negative charges thus introduced on the lattice would certainly necessitate the introduction of cations, and such cations would probably be potentially replaceable."

The relation between the physical properties of soils and the nature of the absorbed bases [trans. title], L. G. KOTZMANN (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 24–26*).—The author examined the effects upon the stability of two soils produced by saturating them with the barium, calcium, magnesium, potassium, sodium, ammonium, and hydrogen ions, respectively. He gave particular attention to the Atterberg constants and mechanical compositions of the treated soils. The entirely different properties of the samples saturated, respectively, with univalent and with divalent bases were found to be especially striking. The soil saturated with the univalent bases, regardless of mechanical composition, formed no stable structural aggregates, the clods formed in the dry soil disintegrating completely when wetted. On the other hand, the clods formed from soil saturated with the divalent bases and the H ion were stable when wetted. Sodium-saturated soil had a distinctly lower rolling-out limit than had the corresponding calcium-saturated soil. The calcium-saturated soil also remained within the plasticity limits optimal for working for a longer time during drying out than did the sodium-saturated soil. In a series of soil preparations in which the absorbed sodium and calcium contents were varied from 0 to 100 percent of saturation,

the stability of aggregates, the plasticity limits, the capillary rise, and other physical properties were all markedly affected when the percentage of saturation with sodium reached from 4 to 5 percent. The effect of absorbed sodium steadily increased with increasing concentrations up to 30 percent of saturation, at which percentage the effect upon the physical properties of the soil was the same as that of complete sodium saturation.

Changes in exchangeable bases in soils as related to fertilizer applications, leaching, and crop removal, M. F. MORGAN (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 70–72*).—In an investigation carried out at the Connecticut [New Haven] Experiment Station, four soils of different textural classes and varying in initial base content and degree of base saturation were each treated with sodium nitrate, ammonium sulfate, urea, and cottonseed meal at the rate of 200 lb. of nitrogen per acre per year over a 5-yr. period. The same quantities of phosphoric acid and potash were applied in all cases. The soils were in circular tanks containing a 7-in. depth of surface soil. No crops were grown on this series of tanks, but semiannual analyses of composites of the leachings were made during the 5 yr. At the beginning and end of the experiment determinations of the various exchangeable bases, total base-exchange capacity, and degree of base saturation were made. One of the above soils was also studied in tanks with subsoil to a depth of 18 in. under annual cropping with tobacco.

Leachings from the sodium nitrate treatments contained most of the sodium applied in the fertilizer. Exchangeable sodium increased slightly, in proportion to the base-exchange capacities of the soils, but there was a minimum of losses of other bases in comparison with the other three forms of nitrogen. Much of the potassium applied in the fertilizer was conserved by the soil in the exchangeable form. In all cases there were increases in exchangeable potassium, in proportion to the total base-exchange capacities of the soils. Potassium and sodium represented approximately 15 percent of the total base-exchange capacity at the end of 5 yr. of treatment, and this resulted in some deflocculation of soil colloids. There was some increase in exchangeable calcium on the soil of least base-exchange capacity, but a decrease in this constituent in the other three cases. "Less calcium was leached than could be calculated from the amounts added in the fertilizer and in the change of exchangeable calcium, indicating some retention of this element in nonexchangeable form, probably as tricalcium phosphate." Magnesium was leached in amounts approximating to the fertilizer application. There was no consistent change in total base-exchange capacity and only a slight increase in degree of base saturation.

The ammonium sulfate treatment "greatly depleted all of the exchangeable bases—calcium, magnesium, potassium, and sodium—but to a smaller degree than could be calculated from the difference between bases added and the leaching of nitrates and sulfates. Large losses of aluminum and manganese in the drainage water accounted for part of this discrepancy. However, losses of calcium by leaching were in excess of the sum of the amounts added and the losses of the exchangeable form, indicating a liberation of nonexchangeable calcium. Exchangeable potassium was severely depleted . . . despite a liberal application of this element in the fertilizer." The quantities of potassium in the leachates were significantly higher than for the other treatments.

"Ammonium sulfate depleted exchangeable magnesium to a smaller percentage of the original amounts in the soil than in the case of the other bases. . . . This treatment reduced all four soils to similar degrees of base saturation, although the soils varied widely with respect to initial base satura-

tion and total base-exchange capacity. . . . There was a small but consistent increase in base-exchange capacity. . . .

"Urea was materially less severe than ammonium sulfate in its effect upon soil bases. It consistently depleted exchangeable calcium, magnesium, and sodium, but permitted an increase in exchangeable potassium on two of the four soils. Its net effect in depletion of exchangeable bases was of the same order of magnitude as the calculated effect resulting from its nitrification."

Cottonseed meal produced losses in exchangeable bases similar to those caused by urea.

"Nitrogen recovery in combined crop and leachings from the cropped tanks approximated to the drainage water losses on the uncropped surface soil of the same type. Total removal of bases from the soil (exclusive of aluminum and manganese, which did not appear in the leachates from the deeper tanks) were not significantly different in the two cases. Data as to pH and exchangeable hydrogen on samples taken at the end of 5 yr. indicate slightly greater alkaline effects from the sodium nitrate treatment on the cropped soil."

The use of rapid soil tests in the United States, R. P. THOMAS (*Jour. Amer. Soc. Agron., 28 (1936), No. 5, pp. 411–419, figs. 2*).—The conclusions quoted were derived from the answers to a questionnaire sent to all the States.

"The use of rapid tests for determining soil deficiencies is extensive. The Middle Western, East-Central, Central Atlantic, and Northeastern States seem to be the most active in this work. The tests for pH value were used more than any other single determination. Lime requirement determinations were made in many States even though pH determinations were made.

"The estimation for phosphorus deficiency was made in two-thirds of the States. Many of these States used more than one method, which indicated that at the present time no one method is entirely satisfactory. The rapid determination for potassium was much more limited. The Corn Belt States, East-Central, Central Atlantic, and Northeastern States were the centers for these tests. Very few States made separate tests for calcium and magnesium unless it was included in the method used in making other determinations. Organic matter, nitrate nitrogen, alkali, and plant tests were reported as being made occasionally by some States. The Eastern Corn Belt States made the largest number of rapid soil tests, with the Central Atlantic States a close second.

"It is very difficult to determine the cost since the methods of reporting varied considerably. The responsibility of the rapid soil testing fell for the most part on the experiment station and teaching staffs. County agents and agricultural teachers made a large portion of the tests in some States, although many States indicated that this was not very desirable. For the most part this service was financed by the experiment station or college, although in some cases the extension service bore all of the expense, while in others it was cooperative.

"Practically every department which does any soils work reported some work with rapid tests. Due to the unsatisfactory results of the tests often reported by the different workers, the majority believe that centralization of the testing in one or two places in each State would be better. Commercial companies on the whole are not encouraged to offer this service to the farmer. Most States reported the results of their tests in letters or symbols. It seemed to be more desirable to send the interpretations and recommendations based upon all obtainable information rather than the results of the tests alone.

"The results indicated that there needs to be considerable collaboration on the treatment of the soil samples and interpretations of the tests made before a comparison of methods can be made. At the present time the most of the States indicated that the rapid tests have been checked under field conditions only to a limited extent. The demand for the use of these tests is increasing rapidly. Since these tests are based on fundamental research and are limited in themselves, very few workers felt that a state of perfection in rapid soil testing had been reached."

Behavior of replaceable cations in the soil and their availability, J. S. JOFFE (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 66, 67*).—The author of a note contributed from the New Jersey Experiment Stations comments briefly upon the results of experiments on the growth of plants in soils of which the exchange complex had been saturated with the calcium, magnesium, potassium, ammonium, and hydrogen ions. The hydrogen saturated soil was prepared by treatment of the soil with a solution of phosphoric acid, and this soil served, therefore, as a source of phosphorus. Soluble salts were removed by dialysis.

"The data obtained corroborate the general observations that the single cation soil is capable of producing a crop which indicates that plants may use the potential cation and anion resources of the soil outside of those in the exchange complex. The NH_4 soil alone appears to be unfit for plant growth, probably due either to the toxicity of the preponderating NH_4 ion or to the increased OH-ion concentration as suggested by Gedroiz. The original untreated soil is sufficiently well supplied with N, which under favorable conditions becomes available. There is, however, clear-cut evidence of the availability of the N from the NH_4 soil. It is an admirable source of N for plants. Calcium from the complex is readily available, frequently more so than the Ca from $CaCO_3$. The NH_4 and especially K ions in the complex seem to depress the intake of Ca from the H soil, which by itself seems to mobilize Ca. Additions of Ca soil to the K soil increased the yield on the latter. The H soil alone is capable of producing a crop, and the results are explained on the basis of the increased acidoid-basoid ratio due to the PO_4 ions. The total exchange capacity of this soil also increased. The variations in the P content of the plants on the H soil and the inhibitory effects of Ca on the P intake are brought out."

Absorption of potassium by plants and fixation by the soil in relation to certain methods for estimating available nutrients, D. R. HOAGLAND and J. C. MARTIN (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 99–103, fig. 1*).—Basing their conclusions upon some 7 or 8 years' study of a considerable number of California soils, carried out at the University of California, the authors "find no reason to believe that any chemical or biological method of a laboratory type will ever be developed by which it will become possible to predict for widely diverse soil, crop, and climatic conditions, with even approximately uniform success, the response of a crop to the application of potassium fertilizers under field conditions. The function of such methods is to be found rather in special investigations of general soil and plant interrelations under highly controlled conditions, and in preliminary field surveys made for the purpose of selecting areas for the establishment of field experiments, possibly eliminating for the time certain areas in which laboratory studies indicate the soil to have an exceptionally high power to supply potassium. The final practical answer in any given case must conform to the results of carefully planned and long continued experiments under field conditions."

Factors affecting the retention of phosphate by clays, R. BRADFIELD, G. SCARSETH, and J. G. STEELE (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935,*

Trans., vol. 1, pp. 74, 75).—This note is a joint contribution from the Ohio State University, the Soil Erosion Service, State College, Pa., and the Alabama Experiment Station.

Phosphate retention was found to be due to at least three distinct mechanisms which overlap under natural conditions but may be separated under suitable experimental conditions.

"At pH values from 2.0–5.0 the retention is due chiefly to the gradual dissolution of Fe and Al and their reprecipitation as phosphates. At pH 4.5–7.5 the phosphate seems to be fixed on the surface of the clay particles. This reaction proceeds very quickly and shows a fairly sharply defined saturation value which is independent of the concentration of the PO_4 added. This saturation value seems to bear no direct relationship to the base-exchange capacity. It is with the clays studied only 20–45 percent of the base-absorbing capacity. At pH 6.0–10.0, if divalent cations are present the phosphate will be fixed largely by the divalent cations."

A simple method of finding the lime status and lime requirement of soils, based on reaction with $CaCO_3$, A. N. PURI and A. S. VANSHYLLA (*Soil Sci., 41 (1936), No. 5, pp. 361–365*).—The authors outline a method of determining the lime status and lime requirement of soils, the procedure to consist essentially in the estimation of exchangeable calcium before and after treatment with $CaCO_3$ by the potassium oxalate method.

It was found that, within limits, the results obtained are independent of the amount of soil, the strength of solution, or the time of shaking. Illustrative results obtained in experiments with some typical Indian soils are shown.

Nitrogen fixation in soybeans as influenced by exchangeable calcium, W. A. ALBRECHT and G. M. HORNER (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 140–144, figs. 2*).—Data here reported from the Missouri Experiment Station indicate that "as the soil offered a constant amount of exchangeable calcium, but at different degrees of calcium saturation, the plant growth, the extent of nodule production, and the nitrogen fixation increased with the percentage of calcium saturation. . . .

"For the particular soil colloid used in this study, a constant level of exchangeable calcium at 87.5 percent saturation for this nutrient element was approximately twice as effective in nodule production and nitrogen fixation as it was at 40 percent saturation. The total amount of calcium taken by the crop was also almost doubled. The percentage content of the crop of this nutrient element was increased about one and one-half times by the higher percentage calcium saturation, paralleling the greater calcium exchange that takes place with increasing calcium saturation when the colloid is in equilibrium with a salt solution."

Conditions which favour nitrogen fixation by a blue-green alga, F. E. ALLISON and S. R. HOOVER (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 145–147*).—From the results of an investigation carried out at the U. S. D. A. Bureau of Chemistry and Soils, the authors conclude that "blue-green algae are of considerable importance in adding to the earth's supply of fixed nitrogen. Judging by the data obtained with the one species of *Nostoc*, it would seem that these organisms thrive best in neutral soils, preferably partly shaded, and where moisture is abundant. Since *Nostoc* can fix nitrogen in the dark if given a satisfactory energy supply, it is probable that nitrogen fixation would be favored by the presence of an abundance of decaying organic matter, especially if the carbon-nitrogen ratio of the latter is wide. The organism is commonly found growing abundantly in small pools of fresh water, and certainly it must be an important nitrogen fixer under such conditions."

The production of ammonia by Azotobacter and its relation to the mechanism of nitrogen fixation, D. BURK and C. K. HORNER (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 148–151*).—Cultures of *A. vinelandii* and of *A. chroococcum* were grown in the Warburg apparatus after various pretreatments at the U. S. D. A. Bureau of Chemistry and Soils. It was observed, in part, that "*Azotobacter* possesses enzymes which enable it to ammonify very great numbers of nitrogenous compounds under both anaerobic and aerobic conditions. It also fixes a large proportion of its nitrogen in a form readily convertible to NH_3 under proper external conditions, which the soil, by virtue of its heterogeneity, is capable of providing at one time or another. Whether *Azotobacter* might fix and liberate a great deal more NH_3 than corresponds to its cell nitrogen derived from N_2 remains to be demonstrated."

The specific catalytic role of molybdenum and vanadium in nitrogen fixation and amide utilization by Azotobacter, D. BURK and C. K. HORNER (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 152–155*).—The authors of this contribution from the U. S. D. A. Bureau of Chemistry and Soils express the belief that, "in the light of the present results, some amide is the only compound which would appear so far to have received fairly strong experimental support in connection with being a specific intermediate in the chemical mechanism of nitrogen fixation by *Azotobacter*. Hydroxylamine . . . can scarcely be an intermediate since . . . *Azotobacter* is unable to utilize hydroxylamine as a source of nitrogen. For the same type of reason, or because of relations with respect to temperature, Mo and V, or Ca and Sr, many common nitrogenous compounds, such as urea, ammonia, nitrite, nitrate, hydrazine, asparagine, glycine, and other organic forms . . . do not appear to behave sufficiently like N_2 in the over-all growth process to indicate that they are specific intermediates in fixation."

The function of cellulose and lignin in the preservation of nitrogen in soils and in composts, S. A. WAKSMAN and I. J. HUTCHINGS (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 1, pp. 163–167*).—In a brief discussion contributed from the New Jersey Experiment Stations, the authors present the view that the preservation of nitrogen in a sand medium depends on a number of factors, among the most important of which are the form in which the nitrogen is added and the nature of the organic substances which serve as sources of humus. "The function of the various constituents of the plant residues in the preservation of the nitrogen differs considerably. Carbohydrates supply the readily available energy for the activities of the microorganisms, with the result that the nitrogen is transformed into microbial cell substance. The function of lignin in the preservation of the nitrogen consists in acting as a buffer for the absorption of the ammonia and in the direct fixation of some of the protein."

The response of rhizobia to natural humic acid, F. E. ALLISON and S. R. HOOVER (*Soil Sci., 41 (1936), No. 5, pp. 333–340, fig. 1*).—Experiments carried out at the U. S. D. A. Bureau of Chemistry and Soils with two species of legume nodule bacteria, *Rhizobium trifolii* and *R. meliloti*, show that the addition of natural humic acid to a synthetic medium (sugar, inorganic salts, and nitrate) produces a marked increase in bacterial numbers and oxygen consumption. The growth obtained, over the concentration range of 0–600 p. p. m. dry matter, was nearly proportional to the quantity added. In the absence of humic acid, and in media in which a very pure sugar was used, no appreciable growth occurred. Synthetic humic acids, prepared by boiling sugar in sulfuric acid, failed to produce a corresponding growth response in these rhizobia regardless of the iron content of such preparations.

"The growth response of the clover and alfalfa nodule bacteria to natural humic acid is due almost wholly to the presence of an essential growth substance and not to the available iron content. This substance, coenzyme R, is essential for respiration and growth of these organisms. The iron requirements of rhizobia are small. The stimulating effect of additions of available iron was usually less than 10 percent in a synthetic medium prepared from C. P. ingredients."

Azotobacter chroococcum and *A. vinelandii* showed no growth response to coenzyme R, which is synthesized by the last-named species to an extent such that *A. vinelandii* was used as one of the sources of the coenzyme.

Chemical changes during decomposition of pineapple trash under field conditions, R. K. TAM and O. C. MAGISTAD (*Soil Sci., 41 (1936), No. 5, pp. 315–327, figs. 2*).—In an experiment begun on November 1, 1934, at the Hawaii Experiment Station, the residual leaf material after a 35-week decomposition period was only 9 percent of the original 18.6 tons per acre dry-leaf portion of the trash. Of the original 8.4 tons of stumps (dry basis), 19 percent remained undecomposed.

All of the organic fractions found in trash underwent decomposition to a certain degree, some proceeding at a greater rate than others. In the order of increasing resistance to decomposition, the various fractions were as follows: Water-soluble fraction, ether-soluble fraction, alcohol-soluble fraction, hemicelluloses, celluloses, and lignins. Water-soluble reducing sugars were decreased from 5.94 to 2.61 percent in the leaf material during the first 2 weeks of decomposition. At the end of 7 weeks only traces of reducing sugar were detectable. This loss was also shown to occur in the case of the stump material. Crude protein in trash increased as decomposition proceeded, whereas water-soluble nitrogen decreased. During the last 12 weeks a decrease in crude protein was detected, with a corresponding increase in water-soluble nitrogen.

The original soil carbon-nitrogen ratio was 4.8:1. With the addition of 27 tons of trash (dry basis), approximately 58 percent of which was carbon, the ratio was increased to 10.8. At the end of 35 weeks of decomposition the carbon-nitrogen ratio was reduced to 5.9, 3.2 tons of residual trash held on a 16-mesh sieve being taken into consideration. The carbon-nitrogen ratio of 16-mesh soil was 5.2. Available nitrogen in soils decreased during the first 23 weeks of decomposition but increased during the last 12 weeks.

Replaceable potassium in the soil continually increased from 0.31 to 1.03 milliequivalents of K_2O in each 100 g of soil, or from 350 to 1,160 lb. per acre-foot, during the 35-week period. This was released from the incorporated trash during decomposition.

Easily soluble phosphorus decreased during the earlier stages of decomposition, regaining its former level in the soil toward the end of the decomposition period.

AGRICULTURAL BOTANY

[Phytophysiological studies by the New Jersey Stations] (*New Jersey Stas. Rpt. 1935, pp. 71–77*).—Brief summaries are given under the following projects: A study of the absorption of "supplementary elements" required in plant metabolism; a report of the analyses for mineral constituents (K, P, Ca, and Mg) of corn plants grown in culture solutions at pH values ranging from 3.0 to 8.0; iron content of corn plants grown in culture solutions at pH levels ranging from 3.0 to 8.0; and the effect of concentration of the nutrient solution on the growth and composition of the tomato.

A study of certain factors influencing the movement of liquids in wood, S. J. BUCKMAN, H. SCHMITZ, and R. A. GORTNER (*Jour. Phys. Chem., 39 (1935),*

No. 1, pp. 103–120, figs. 7; abs. in Minnesota Sta. Rpt. 1935, pp. 26, 27).—In this study at the Minnesota Experiment Station, the maximum and average effective diameters of the pores in the pit membranes of the wood were found to vary with the moisture content. Below the fiber-saturation point, effective pore diameters decreased with increasing moisture. The influence of pressure on the rate of water flow through wood proved to be a characteristic of the kind of wood. The relationship between pressure and rate of water flow is perhaps influenced by such factors as thickness of the pit membrane and presence and effectiveness of resin canals. This relationship in several woods was not significantly changed by drying the wood before use, nor did such drying appear to cause pronounced, permanent changes in the permeability of the woods to water.

The rate of flow of organic liquids or salt solutions could not be predicted necessarily from their viscosities, and the same was true for the rate of flow of organic liquids through Norway pine sapwood. The evidence indicated that the magnitude of the deviations from a viscosity relationship for the flow of organic liquids would differ for different kinds of wood. The decrease in rate with time in balsam fir heartwood for benzene, bromobenzene, and nitrobenzene increased with increasing polarity of the liquid. Apparently the movement of liquids of widely different properties in wood cannot be predicted necessarily from the viscosity alone, other factors entering into the picture (e. g., the influence of the liquid on the effective capillary dimensions of the openings in the wood and the possible effect of electrical "back pressure" on the flow of polar organic liquids). The relative importance of factors other than viscosity may perhaps be expected to vary with the kinds of wood and the properties of the liquids.

Some aspects of the internal water economy of the sugar cane plant, H. A. WADSWORTH (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 40 (1936), No. 1, pp. 21–33, figs. 4*).—"Some evidence is present that the moisture content of H 109 cane, grown under irrigated conditions, suffers a diurnal variation of considerable magnitude. Such moisture content is higher at daybreak and lower at nightfall. Such determinations were made by use of the hand refractometer, it being assumed that variations in Brix might be more accurately charged to variations in moisture than in soluble material. An attempt to duplicate the results with other varieties (P. O. J. 2878 and Yellow Caledonia) at Hilo Variety Station failed to give significant results unless an unconvincing temperature correction is invoked. There is some speculation as to the role of this daily moisture fluctuation and sugar formation."

Effect of ammonium and of nitrate nitrogen on the composition of the tomato plant, H. E. CLARK (*Plant Physiol., 11 (1936), No. 1, pp. 5–24*).—In this study by the Connecticut [New Haven] Experiment Station, tomato plants 1 mo. old were grown subsequently for 49 days in sand cultures with continuously renewed solutions at pH 6.7, in (1) calcium nitrate ($Ca(NO_3)_2$), in (2) an equivalent amount of ammonium sulfate ($(NH_4)_2SO_4$), and in (3) one-third as much $(NH_4)_2SO_4$. Analyses of the harvested, dried tissue indicated the effects of the form and concentration of nitrogen of the solutions on the growth and composition.

Differences between the "nitrate" and the "ammonium" plants were diminished by decreasing the $(NH_4)_2SO_4$ concentration. The fresh weight of the tops was greater in the nitrate than in the ammonium series, but there was no significant difference in weight with respect to plants in dilute v. concentrated $(NH_4)_2SO_4$ solutions. The dry matter was slightly higher in the ammonium stems, but that in the leaves of all series was about the same. A

high concentration of nitrate nitrogen occurred in the nitrate plants, and consequently the total unassimilated nitrogen was much higher there. A considerably greater amount of ammonium nitrogen occurred in the ammonium series, and more in those in the concentrated than in the dilute solutions. Much greater amounts of glutamine and of asparagine nitrogen were found in the ammonium series, indicating the ready formation of amide from ammonium nitrogen. More total amino nitrogen occurred in the ammonium series, but this was due largely to the higher concentration of glutamine and asparagine. Amino nitrogen (exclusive of glutamine and asparagine) formed a small part of the total amino nitrogen in the ammonium plants, but a relatively large part in the nitrate group. A higher concentration of soluble organic nitrogen was present in the ammonium plants, and the larger part of this occurred in forms analytically established, while in the nitrate plants the larger part of the total soluble nitrogen was in undetermined forms. The concentration of insoluble ("protein") nitrogen was higher in the ammonium series, but the percentage of ash was greater in the nitrate plants. The concentration of the three known acids (oxalic, malic, and citric) was much higher in the nitrate plants and the amount of total organic acids was also greater, but of the latter the known acids constituted the greater portion in the tops. On the other hand, the unknown acids composed the larger part of the total acids in the ammonium series and in the roots of the nitrate plants.

"An interrelationship is suggested between the absorption and assimilation of nitrogen, the accumulation of ash constituents, and the synthesis of organic acids by the plants, evidence of the complexity of the effect of the form of nitrogen in the culture solution."

Zinc sulphate studies in the soil, O. E. GALL (*Citrus Indus., 17 (1936), No. 1, pp. 20, 21*).—In this study by the Florida Experiment Station, greenhouse and pot tests were carried out to determine what became of the zinc after it was added to the soil and how much could be added before reaching the toxic limits. The results appear to indicate but little danger of zinc toxicity developing in soils from the present recommended applications of zinc sulfate.

The effect of certain chemicals on the catalase activity in plants, R. H. LANDON (*Amer. Jour. Bot., 21 (1934), No. 9, pp. 583–591, fig. 1; abs. in Minnesota Sta. Rpt. 1935, p. 13*).—In this contribution from the Minnesota Experiment Station an accurate and rapid method for catalase determinations is described.

The toxicity of a chemical could not be determined accurately from its effect on the catalase activity of tissue preparations, nor could it be predicted from its similarity to compounds of known toxicity.

The measurement of changes in catalase activity should prove useful in studying the herbicidal properties of chemicals, provided the toxic action peculiar to the chemical being investigated is taken into consideration.

Effect of petroleum oils on the respiration of bean plants, apple twigs and leaves, and barley seedlings, J. R. GREEN (*Plant Physiol., 11 (1936), No. 1, pp. 101–113, figs. 2*).—In this study by the Montana Experiment Station, the averages of several tests with plants sprayed with poorly refined oils indicated an increased respiratory rate, though individual determinations showed that in some cases it was retarded. The averages of similar tests with highly refined oils also gave an increase, but to a smaller extent, and individual determinations indicated that these oils also may retard respiration. The changes in rate thus induced extended over long periods. When large amounts of oil were sprayed on barley seedlings, about the same respiratory change was induced as with small amounts.

Transpiration and the cooling of leaves, O. F. CURTIS (*Amer. Jour. Bot., 23 (1936), No. 1, pp. 7–10, fig. 1*).—In this contribution by Cornell University, it

is stated that "since leaves enclosed in cellophane envelopes or glass chambers and exposed to strong light reach temperatures about 20° C. higher than similar leaves covered with vaseline, and since vaseline may not completely prevent transpiration, some investigators have concluded that transpiration has a more pronounced cooling effect than commonly thought and that high temperatures of leaves in envelopes transparent to visible radiation are due chiefly to stoppage of transpiration. Cellophane envelopes, however, have similar effects in raising the temperature of dry, black paper. The excess temperature is chiefly due to the trapping effect of the envelope, which reduces heat loss by conduction and radiation.

"It is suggested that the higher leaf temperatures relative to air temperatures in humid regions, which are usually ascribed to diminished transpiration, are partly due to the effect of the high moisture of the atmosphere in preventing loss by radiation in the infrared."

Further studies on exudation in cucurbits, A. S. CRAFTS (*Plant Physiol., 11 (1936), No. 1, pp. 63–79*).—Continuing this study[1] by the California Experiment Station, phloem exudate was collected from squash plants for periods of 12 and 24 hr. The exudation fluctuated in rate but did not stop. That from excised stems depended in volume on the size of the stems and not on the condition of local tissues. Excised root systems of squash exuded more than their own weight in xylem sap in 24 hr. Phloem exudate was about 8 to 20 times as concentrated as xylem exudate.

Phloem sap from cucurbits coagulated with heat, alcohol, or long standing. Xylem sap did not coagulate. Phloem sap exuded in relatively small quantities, soon stopping, and exudation could be maintained only by frequent cutting. Xylem sap exuded in much larger quantities and flowed for hours without interruption. Phloem exudation may take place from wilted plants. Xylem exudation occurs only where transpiration loss has been greatly reduced or eliminated. Phloem sap had a pH of 7.3 and was well buffered. Xylem sap was practically unbuffered and had a pH of 5.5. Plugging of the phloem apparently results from the coagulation of the phloem sap within the interstices of the walls of the cut phloem elements.—(*Courtesy Biol. Abs.*)

The effect of centrifugal force on root-tips of Pisum sativum at various temperatures, H. T. NORTHEN (*Amer. Jour. Bot., 23 (1936), No. 1, pp. 64–69, figs. 8*).—In this contribution by the State College of Washington, comparisons were made of the effects of a centrifugal force 1,000 times that of gravity for a maximum of 15 min. on the root tips of pea plants previously maintained at constant temperatures of 10°, 25°, and 35° C., respectively. The ease of throwing down the nucleus and cytoplasm was correlated with the cell sap specific gravity. In the plerome cells of the meristematic region the sap specific gravity was equal to that of the cytoplasm and nucleus, but in older plerome cells and in most cells of the periblem the sap specific gravity was lower. By noting the degree of movement of the nucleus through the cytoplasm, it is concluded that in the meristematic region of the plerome and in the periblem cells the specific gravity of the nucleus and cytoplasm is the same, but that in the older plerome cells that of the nucleus is greater.

The chondriosomes did not move in centrifuging, and hence are concluded to have a specific gravity about equal to that of the cytoplasm. The nucleoli, nuclear reticula, and prophase chromosomes were in no case displaced, indicating their specific gravity to equal that of the nuclear sap.

The viscosity of the cytoplasm during mitosis cannot be determined by noting the displacement of the mitotic figure, the degree of displacement apparently

[1] Plant Physiol., 7 (1932), No. 2, pp. 183–225, pls. 6, fig. 1.

being determined more by the relative densities of the cell sap, cytoplasm, and mitotic figure than by the viscosity of the cytoplasm. The centrifuged mitotic figures behaved like the nuclei in adjacent cells, suggesting their specific gravity to be the same as that of the nucleus.

Growth of fragments of excised root tips, W. J. ROBBINS, M. BARTLEY, and V. B. WHITE (*Bot. Gaz., 97 (1936), No. 3, pp. 554–579, figs. 16*).—In this study by the University of Missouri, excised corn root tips cultured under sterile conditions in a nutrient medium grew in most cases when 0.5 mm or more long, and in all cases when 0.9 mm or more long. Divided longitudinally into equal parts, each part of the excised root tips of corn and pea from 1 to 2 mm long developed into complete roots in the medium used. When such root tips were similarly divided so that one part contained most of the plerome, the larger part developed into a complete root, while the smaller part grew but lacked one or more portions. When similarly divided into three or more pieces, a piece comprising less than one-half of the root tip developed into a complete root, but one containing only a quarter did not. Divided obliquely through the apex of the meristem, both pieces sometimes, but not always, developed into a complete root. Similarly divided through the basal part of the meristem, the tip piece developed into a complete root, but the basal part formed no apical meristem. When wheat root tips were divided longitudinally, neither piece developed into a complete root. The same was true when the tips were cut obliquely or transversely through the meristem apex, but when similarly cut through the basal part of the apical meristem the tip fragments developed into complete roots and the basal fragments regenerated a new apical meristem.

There were four types of response in fragments of apical meristems of root tips, viz, little or no development, formation of filaments of parenchyma cells, formation of a root in which stelar tissue differentiated but no apical meristem remained, and formation of a normal root. Injury by the cut may affect the character of the development of fragments of the apical meristem of roots.

The effect of electrolytes present in the growth media upon the electrophoretic mobility of Escherichia coli, J. T. PEDLOW and M. W. LISSE (*Jour. Bact., 31 (1936), No. 3, pp. 235–244, figs. 2*).—This is a contribution by the Pennsylvania Experiment Station.

The effect of certain X-rays on the electrophoretic mobility of Escherichia coli, M. E. SMITH, M. W. LISSE, and W. P. DAVEY (*Jour. Bact., 31 (1936), No. 3, pp. 275–286*).—This is a contribution by the Pennsylvania Experiment Station.

North American species of Monilinia.—I, Occurence, grouping, and life histories, E. E. HONEY (*Amer. Jour. Bot., 23 (1936), No. 2, pp. 100–106, figs. 4*).—This paper from the University of Wisconsin introduces a series of studies initiated to increase the knowledge of the North American Monilinias. The generic concepts of *Oidoria*, *Sclerotinia*, *Ruitstroemia*, and *Stromatinia* are briefly mentioned, and the methods of study, both in the field and laboratory, are indicated.

The species included under *Monilinia* are divided into two sections on the basis of the presence or absence of disjunctors within the macroconidial fruiting chains, and the disjunctor and the method of separation of the macroconidia are described and illustrated. Aromatic odor, life histories, and specialization of parasitism are correlated with the morphologic grouping into the two sections. Representative species of the two sections are listed, with notes.

Hydrogen-ion concentration and the toxicity of basic and acid dyes to fungi, E. KOBS and W. J. ROBBINS (*Amer. Jour. Bot., 23 (1936), No. 2, pp.*

133–139, figs. 6).—In this study by the University of Missouri a uniform concentration of eosin, rose bengal, or dahlia dyes was added to cultures of *Gibberella saubinetii*, *Fusarium oxysporum*, and *Rhizopus nigricans* at pH values of from 4.0 to 8.0. The toxicity of each dye was then determined by comparing the growth on the medium at a particular pH value with and without the dye.

A concentration of rose bengal, with little effect on the *G. saubinetii* growth at pH 7.3, completely inhibited it on potato dextrose agar at pH 4.5. In some cases even the change of a fraction of a pH had a marked effect. In general, an increase in acidity increased the toxicity of the acid dyes eosin and rose bengal and decreased that of the basic dahlia, but the precipitation of the rose bengal in the most acid solutions in some cases reduced its toxicity.

Changes in reaction due to the growth of the organisms may obscure the true correlations, and to overcome this difficulty bits of mycelium were placed in sodium phosphate buffer mixtures at from pH 3.8 to 8.2 with and without the dye. After 12 hr. the mycelia were removed and cultured on potato dextrose agar. The acid dye rose bengal was most injurious in the more acid solutions, while the basic dye dahlia was most so in the more alkaline solutions.

It is believed that the effect of pH on the dye toxicities is due to its influence on the formation by the dyes of free base or acid. Correlations between the isoelectric points and the effects of pH on the toxicities of the dyes were not evident in these experiments.

Dissociation of Saccharomyces aceris-sacchari Fabian and Hall and Pichia alcoholophila Klöcker, L. J. WICKERHAM and F. W. FABIAN (*Jour. Infect. Diseases, 58 (1936), No. 2, pp. 165–171, figs. 19*).—This is a contribution by the Michigan State College.

The status of the generic term Bacterium Ehrenberg, 1828, R. S. BREED and H. J. CONN (*Jour. Bact., 31 (1936), No. 5, pp. 517, 518*).—In this contribution from the New York State Experiment Station, the authors recommend "that *Bacterium* be accepted as a temporary generic term with an admittedly unrecognizable type species *B. triloculare* Ehrenberg to include those species of non-spore-forming, rod-shaped, motile, or nonmotile bacteria whose relationships to other bacteria are not clear. When relationships to other similar species have been developed by investigation, then this generic term would naturally be dropped. This would permit, for example, the retention of such a species as *B. radiobacter* in the genus *Bacterium* until its systematic position is better understood."

A study of the species Lactobacillus plantarum (Orla-Jensen) Bergey et al., C. S. PEDERSON (*Jour. Bact., 31 (1936), No. 3, pp. 217–224, figs. 2*).—This contribution by the New York State Experiment Station retains the name *L. plantarum* for the species here characterized.

Diversion of the normal heterolactic dissimilation by addition of hydrogen acceptors, M. E. NELSON and C. H. WERKMAN (*Jour. Bact., 31 (1936), No. 6, pp. 603–610*).—This contribution by Iowa State College shows that acetaldehyde and acetylmethylcarbinol added to fermentations of glucose by *Lactobacillus lycopersici* are readily hydrogenated.

The aerobic dissimilation of lactic acid by the propionic acid bacteria, C. ERB, H. G. WOOD, and C. H. WERKMAN (*Jour. Bact., 31 (1936), No. 6, pp. 595–602*).—This is a contribution by Iowa State College.

Studies on anaerobic bacteria.—IX, Antigenic relations of Clostridium bifermentans and Clostridium centrosporogenes, E. McCOY and L. S. MCCLUNG (*Jour. Bact., 31 (1936), No. 5, pp. 557–568*).—Continuing this series

(E. S. R., 74, p. 179), the serological evidence presented in this study from the University of Wisconsin, together with morphological and physiological data, leads to the conclusion that the concept of a single species, *C. bifermentans*, is adequate.

The nitrogen distribution of Azotobacter chroococcum, J. E. GREAVES and W. REEDER (*Utah Acad. Sci., Arts, and Letters, Proc., 12 (1934–35), pp. 97–100*).—In this study by the Utah Experiment Station, *A. chroococcum* secreted no soluble nitrogen in the synthetic medium used. As determined by the micro-Van Slyke method, its protein is similar to that of the leaves of spinach and alfalfa and thus probably plantlike in nature. Since all plant (and other) proteins must be broken down before they are utilized by other plants, it is believed that the proteins of *A. chroococcum* must also be decomposed by other micro-organisms before the higher plants can utilize the fixed nitrogen.

Preparation of sintered Pyrex glass aerators for use in water culture experiments with plants, A. H. FURNSTAL and B. JOHNSON (*Plant Physiol., 11 (1936), No. 1, pp. 189–194, figs. 4*).—In this contribution by the University of California, details of technic are presented for the grinding, grading, and sintering of glass particles into inert, resistant aeration units of uniform quality and capable of dispersing gases in fine bubbles. Construction diagrams are included.

A dilatometer for plant materials, G. A. GREATHOUSE and M. W. PARKER (*Plant Physiol., 11 (1936), No. 1, pp. 209–211, fig. 1*).—The dilatometer described in this contribution by the University of Maryland is an all Pyrex glass system which can be evacuated and filled without disturbing the material used as a sample.—(*Courtesy Biol. Abs.*)

Plant material introduced by the Division of Plant Exploration and Introduction, Bureau of Plant Industry, January 1 to March 31, 1934 (*U. S. Dept. Agr., Inventory 118 (1936), pp. 41*).—This number lists 1,047 lots of plant material. Many descriptive notes are included.

GENETICS

Chromosome numbers in the Leguminosae, D. C. COOPER (*Amer. Jour. Bot., 23 (1936), No. 3, pp. 231–233, figs. 16*).—Chromosome numbers are reported from studies at the Wisconsin Experiment Station probably for the first time in 13 species representing 7 genera of the Leguminosae. The somatic numbers reported are: *Lespedeza variegata* $2n=18$, *L. sericea* 18, *L. stipulacea* 20, *L. tomentosa* 20, *L. daurica* 36, *Medicago dzawakhetica* 16, *M. heniocyela* 32, and *M. glutinosa* $2n=32$. The haploid numbers reported are: *Baptisia australis* $n=9$, *Lupinus polyphyllus* 24, *Desmodium grandiflorum* 11, *Swansonia galegifolia* 16, and *Amphicarpa monoica* $n=10$. Two satellite chromosomes were observed in the somatic divisions of *L. variegata*, *L. tomentosa*, and of the three species of *Medicago*. The somatic chromosomes of the *Lespedeza* species range from 1.5μ to 5μ in length, whereas those of the *Medicago* species range from 2μ to 3.5μ in length.

Inheritance of resistance to Ustilago levis (K & S) Magn. (covered smut) in a cross between Markton and Colorado 37 oats, W. W. AUSTIN and D. W. ROBERTSON (*Jour. Amer. Soc. Agron., 28 (1936), No. 6, pp. 467–471*).—Behavior in the F_3 of Colorado 37 (susceptible) × Markton (resistant) oats at the Colorado Experiment Station indicated that a two-factor difference for smut exists between the parents. Markton possesses the two dominant factors for resistance, while Colorado 37 has the recessive allelomorphs of these factors. Some promising, highly resistant lines were being continued

in the hope of developing some high-yielding, smut-resistant, commercial strains.

Inheritance of seedling stem color in a broomcorn-sorghum cross, C. M. WOODWORTH (*Jour. Amer. Soc. Agron., 28 (1936), No. 4, pp. 325–327*).—The breeding behavior in F_3 of red-stemmed F_2 plants of Shallu × Black Spanish broomcorn, in Illinois Experiment Station studies, approximated the ratio of one plant breeding true for red; four segregating for red and green in a 3:1 ratio; and four segregating for red and green in a 9:7 ratio, confirming expectations based on two genes, both of which must be present to produce red.

Squash-pumpkin hybrids throw light on evolution of these forms, G. P. VAN ESELTINE (*Farm Res. [New York State Sta.], 2 (1936), No. 4, pp. 6, 9, fig. 1*).—Interspecific crosses between the three species of cucurbits, namely, *Cucurbita maxima*, *C. moschata*, and *C. pepo*, resulted in some fertile hybrids in the case of *C. moschata* × *C. pepo*. *C. maxima* ×. *C. moschata* yielded hybrids the staminate flowers of which were sterile, forming no pollen. Self-pollination of the fertile *moschata* × *pepo* hybrids yielded fruits with viable seeds, plants from which when studied as to the inheritance of various stem, fruit, leaf, and flower characters gave evidence that *C. moschata* is probably the most ancient form, from which came first *C. maxima* and lastly *C. pepo*. Among the new types were some that apparently were either immune or highly resistant to squash mosaic, and efforts to develop attractive and productive varieties are in progress. A detailed analysis is presented of the breeding results.

Cytology and fruit breeding.—IV, How hybrid ratios are predicted, B. R. NEBEL (*Farm Res. [New York State Sta.], 2 (1936), No. 4, p. 11, figs. 2*).—In this fourth contribution (E. S. R., 75, p. 191) the author discusses with diagrams the backcrossing of a peach × nectarine F_1 hybrid with its nectarine parent, with special reference to the segregation of the fuzz character in the resulting progeny.

Physiological and evolutionary theories of dominance, S. WRIGHT (*Amer. Nat., 68 (1934), No. 714, pp. 24–53, figs. 7*).—In presenting statistical evidence on theories relating to physiological explanations of dominance, it is pointed out that generally the most active phase of a gene is dominant over the less active phases. At the same time dominance may depend upon building up a factor of safety for the most adaptive type of the species.

Professor Wright on the theory of dominance, R. A. FISHER (*Amer. Nat., 68 (1934), No. 717, pp. 370–374*).—A discussion of differences with Wright on the theory of dominance.

Professor Fisher on the theory of dominance, S. WRIGHT (*Amer. Nat., 68 (1934), No. 719 pp. 562–565*).—A further discussion of the theory of dominance.

A dairy sire progeny test, B. L. WARWICK and O. C. COPELAND (*Jour. Heredity, 25 (1934). No. 5, pp. 177–181*).—A dairy sire progeny test is suggested by the Texas Experiment Station based on the use of dams homozygous for multiple recessive factors which are low producers.

A herd of cattle bred for twenty years without new blood, J. L. LUSH (*Jour. Heredity, 25 (1934), No. 6, pp. 209–216, figs. 3*).—A description is given of a purebred Shorthorn herd in which no outside blood was introduced in 20 yr. in an attempt to conserve the good qualities of an outstanding sire. The average relationship of the young herd to the original sire was 42 percent. The average inbreeding was only 16.9 percent. This furnished a demonstration that a moderate-sized herd may follow a close breeding practice with one, later two, and then later one sire with an increase in the uniformity and merit of the resulting herd.

[Sheep breeding] (*South Dakota Sta. Rpt. 1935, pp. 16, 17*).—Results are briefly presented on breeding for taillessness in sheep and quality of fleece of lambs produced by coarse- and fine-fleeced Karakuls.

A faceless lamb, L. M. WINTERS and H. C. H. KEENKAMP (*Jour. Heredity, 26 (1935), No. 1, pp. 33, 34, figs. 2; abs. in Minnesota Sta. Rpt. 1935, p. 22*).—The birth of a lamb in the Minnesota Experiment Station flock which was normal except for the lack of a face is noted. The possible hereditary basis for the condition is discussed.

An eight generation experiment in inbreeding swine, R. E. HODGSON (*Jour. Heredity, 26 (1935), No. 5, pp. 209–217, figs. 2; abs. in Minnesota Sta. Rpt. 1935, pp. 22, 23*).—An account is given of progress made in inbreeding Poland-China swine by brother-sister matings at the Minnesota Experiment Station. Of seven inbred lines started, three were lost in the first generation and one in the third generation due to the reluctance of boars to mate with their litter mate sisters. The other lines were carried to the fifth, sixth, and eighth generations of inbreeding.

It seems evident that disposition is inherited, but the anomalies occurring were considered small.

There was less difficulty in getting boars to mate with their litter mate sisters after the fifth generation. In one line the sows were vicious at parturition, and another line was so docile that they did not take good care of the pigs.

Yellow spotting and white spotting were the principal color anomalies occurring. A few abnormalities in the functioning of the reproductive organs occurred.

It appears that the two main inbred lines with the two subdivisions of each can be continued indefinitely. There was evidence from the litter size, mortality, and rate of growth that inbreds were less vigorous than non-inbreds but the differences were small. Crosses of the inbred lines reached the weight of 200 lb. 4 weeks earlier than non-inbreds and 7 weeks earlier than inbreds.

It appears that segregation of vigor occurred, and some lack of vigor was eliminated through inbreeding.

New pathological hereditary factors in dogs [trans. title], W. KOCH (*Ztschr. Induktive Abstam. u. Vererbungslehre, 70 (1935), No. 3–4, pp. 503–506, figs. 3*).—Several abnormalities which are hereditary in dogs are described.

Polydactylous guinea pigs, S. WRIGHT (*Jour. Heredity, 25 (1934), No. 9, pp. 359–362, figs. 2*).—Attention is called to different types of polydactylous guinea pigs. In one there is an atavistic return of the little toe, the occurrence of which depends upon crossing a physiological threshold and not on segregation of a unit factor. In the other, the heterozygous mutant type usually have thumbs and little fingers whereas the homozygotes show various abnormalities in the legs, face, and belly.

Chinchilla mutation in the wild hare, R. PRAWOCHENSKI (*Jour. Heredity, 26 (1935), No. 4, pp. 145, 146, fig. 1*).—A chinchilla hare shot near the Jagellonian University is described as a parallel mutation occurring in two closely related species.

The production and inheritance of eye defects in rabbits, H. L. IBSEN and L. D. BUSHNELL (*Amer. Nat., 68 (1934), No. 714, pp. 92–95*).—A comparison of the senior author's results (E. S. R., 69, p. 193) and those of Guyer (E. S. R., 44, p. 566) in inducing eye defects in rabbits is presented, from which the authors conclude that proof of the permeability of the placenta to lens antibodies is lacking.

Blood group inheritance in rabbits, C. E. KEELER and W. E. CASTLE (*Jour. Heredity, 25 (1934), No. 11, pp. 433–439, pl. 1, figs. 8*).—The four blood groups in

the rabbit, involving the absence of the agglutinogens or the presence of one or the other or both of the agglutinogens, H_1 and H_2, are described. In the absence of the corresponding agglutinins no agglutination takes place, but the injection of one agglutinogen induces the production of the agglutinins to unite with them. The agglutinogens are transmitted as allelomorphic characters, both dominant to their absence, but neither interferes with the action of the other.

Some protective medium seems to be operating to prevent unfavorable actions that must be expected in certain types of matings where incompatible agglutinins are artificially built up in the dam.

Hereditary brachydactylia and associated abnormalities in the rabbit, H. S. N. GREENE (*Science, 81 (1935), No. 2104, pp. 405–407*).—The occurrence of a deformity in rabbits ranging from brachydactylia to acheiropodia is described. The condition was evidently due to the operation of a single recessive factor. Matings of heterozygotes produced 145 normals and 48 abnormals. Backcross matings produced 31 normal and 19 abnormal young. The abnormals were not as vigorous as normals, and only about 30 percent of the matings of abnormal females resulted in pregnancy. Only two affected males were reared, and no progeny were obtained from them. Attention is called to the similarity of the condition to hereditary abnormalities of the hands and feet in man.

Dominance in the domestic mouse [trans. title], A. L. HAGEDOORN (*Ztschr. Induktive Abstam. u. Vererbungslehre, 70 (1935), No. 3–4, pp. 509–512*).—A discussion of the expression of different characters leads to the conclusion that dominance is only a relative conception.

Linkage of the genes for non-yellow (y) and pink-eye (p_2) in the house mouse (Mus musculus), E. ROBERTS and J. H. QUISENBERRY (*Amer. Nat., 69 (1935), No. 721, pp. 181–183*).—The combined effect of the pink-eye gene (p_2), in the house mouse, and pink eye (p_1) was found to produce a very light-colored coat.

In studies at the Illinois Experiment Station p_2 was found to be linked with nonyellow (y). Among 455 back-cross progeny there were 20 percent cross-overs. Although the differences were small, crossing-over in males was less than in females.

A second rexoid coat character in the house mouse, C. E. KEELER (*Jour. Heredity, 26 (1935), No. 5, pp. 189–191, figs. 2*).—A mutation involving a wavy condition of the coat and short vibrissae was found to be inherited as a simple recessive to the normal. When crossed with the wavy stock of Crew (E. S. R., 69, p. 510) only normals were produced, suggesting that two pairs of genes were involved.

Brown and silver deer mice, R. R. HUESTIS and E. BARTO (*Jour. Heredity, 25 (1934), No. 6, pp. 219–224, figs. 2*).—Coat colors in *Peromyscus maniculatus* corresponding to brown and silver agouti in *Mus* were found due to non-allelomorphic recessive genes.

Two related hairless mutations in the Norway rat, H. W. FELDMAN (*Jour. Heredity, 26 (1935), No. 4, p. 162*).—The two types of hairlessness in the rat described by Roberts (E. S. R., 58, p. 320) and Wilder et al. (E. S. R., 60, p. 194) were found, after crossing the two strains, to be due to identical or very similar allelomorphs, although phenotypical differences in the location and arrangement of the skin folds in aged animals from the two strains were distinguishable.

Reproductive ability and viability of progeny in relation to age of sires and dams, M. A. JULL (*Poultry Sci., 14 (1935), No. 2, pp. 105–111*).—Study of the reproductive ability and viability of the 1925–1931 progeny in relation to the age of sires and dams, among the White Leghorn and Rhode Island Red

birds produced in the flocks of the U. S. D. A. Bureau of Animal Industry, showed that if the progeny of a sire or dam at one age gave good results, good results were also obtained at other ages.

Progeny of inbred and non-inbred Rhode Island Red males, F. A. HAYS (*Poultry Sci., 14 (1935), No. 2, pp. 122–125*).—An analysis at the Massachusetts Experiment Station of the variability and production records of the progeny of 36 non-inbred and 11 inbred Rhode Island Red males showed that the progeny of the inbred males were only a little less variable than the non-inbreds in age at sexual maturity, body weight, and egg weight, and were no different in their winter and annual egg production. The winter and annual egg production was lowered by the use of the inbred males.

Interrelationship of body weight, production, and egg weight, G. W. KNOX, JR. (*Poultry Sci., 13 (1934), No. 4, pp. 227–229*).—Data are given on the relationship of body weight to number and weight of eggs laid by birds of different breeds in the Fifth Georgia Egg Laying Contest, and the Second, Third, and Fourth Louisiana Egg Laying Contests.

Some genetic aspects of hatchability, T. C. BYERLY, C. W. KNOX, and M. A. JULL (*Poultry Sci., 13 (1934), No. 4, pp. 230–238, figs. 8*).—Studies of the incidence and time of embryonic mortality in hatching eggs of the breeding flocks at the U. S. D. A. Animal Husbandry Experiment Farm, Beltsville, Md., showed that, in general, crossing of breeds increased hatchability if the hatchability of the pure breeds was low. This was the result of a decreased mortality during the third week of incubation.

Top-crossing the F_1s on a third breed generally lowered mortality. Inbreeding greatly increased mortality during the third week.

It is concluded that "the inheritance of hatchability must be determined by a very large number of genes, because (1) three lethal genes have already been positively identified; (2) crosses between breeds, both of which have low hatchability, improve hatchability; (3) inherited factors affecting egg quality probably affect hatchability; and (4) inbreeding of itself, in some cases, appears to decrease hatchability."

Creeper and single-comb linkage in the fowl, L. W. TAYLOR (*Jour. Heredity, 25 (1934), No. 5, pp. 205, 206*).—Data from the California Experiment Station showed a linkage of about 0.5 percent between the single-comb and creeper genes in the fowl, confirming Landauer's findings (E. S. R., 69, p. 196).

Congenital tremor in young chicks, F. B. HUTT and G. P. CHILD (*Jour. Heredity, 25 (1934), No. 9, pp. 341–350, figs. 3; abs. in Minnesota Sta. Rpt. 1935, pp. 25, 26*).—A condition designated as congenital tremor in chicks is described by the Minnesota Experiment Station. Of the chicks exhibiting the condition at hatching, 88 percent died before 1 mo. of age. Matings of carrier males and females produced 408 normal and 39 progeny with tremors. It was shown that the condition might be due to the operation of two recessive factors or more probably due to a single recessive autosomal gene so subject to modifying genes that its manifestation is unusually low. Embryonic mortality was not a factor.

An attempt to produce turkey-chicken hybrids, D. C. WARREN and H. M. SCOTT (*Jour. Heredity, 26 (1935), No. 3, pp. 105–107, fig. 1*).—By artificial insemination of a turkey hen with semen from a Rhode Island Red male at the Kansas Experiment Station, there were produced two fertile eggs. One embryo died after a few days of incubation, but the other lived for 22 days during the incubation period. Two other turkey hens produced four and eight fertile eggs after artificial insemination with semen from a White Leghorn male. Only one egg produced by the opposite cross showed signs of fertility. All embryos died before hatching.

The development of the testes and scrotum of the ram, bull and boar, R. W. PHILLIPS and F. N. ANDREWS (*Massachusetts Sta. Bul. 331 (1936), pp. 16, figs. 28*).—The development of the testicle and the tunica dartos muscle of the ram, bull, and boar are described. Spermatozoa first appeared at 147 days of age in the ram, 224 days in the bull, and 147 days in the boar. An increased sensitivity of the dartos muscle to heat occurred as mature sperm were produced. A low plane of nutrition in the boar delayed maturity of the spermatozoa and the development of the temperature regulatory action of the dartos muscle, for which a testicular hormone seems responsible.

Changes in the reproductive organs of the ewe with some data bearing on their control, H. H. COLE and R. F. MILLER (*Amer. Jour. Anat., 57 (1935), No. 1, pp. 39–97, pls. 5, fig. 1*).—A study of the sexual cycle in 55 Southdown, Shropshire, and Hampshire ewes was conducted at the California Experiment Station, and the different stages are described. Significant changes in the hormone content of the ewes' pituitary were noted, but none of the gonadotropic hormones was found in the serum of the pregnant or nonpregnant ewes.

The influence of the gonadotropic hormone and oestrin on different stages of the cycle was studied in 93 7-year-old Romney-Rambouillet ewes. Oestrum and ovulation were induced by doses of 100 rat units of gonadotropic hormones given at 17-day intervals. Oestrin induced oestrum during anoestrum, but when given with the gonadotropic hormone, ovulation was induced without oestrum.

Cytology of the mammary gland of the albino rat, I, II, K. R. JEFFERS (*Amer. Jour. Anat., 56 (1935), No. 2, pp. 257–277, pl. 1; pp. 279–303, pls. 2*).—In part 1, dealing with pregnancy, lactation, and involution, the histological changes in the mammary gland of the rat are described. Part 2, on experimentally induced conditions, deals with a histological study of the mammary glands of rats, indicating their activity following the weaning of the young without nursing, pseudopregnancy induced by suckling, the presence of an inert body in the uterus, hypophysectomy, and the administration of hormones.

The effect of pregnancy on hair growth and shedding in the guinea-pig, D. H. STRANGEWAYS (*Jour. Agr. Sci. [England], 23 (1933), No. 3, pp. 379–382, fig. 1*).—Decreased hair growth and increased shedding occurred during pregnancy, with an increased hair growth following parturition.

The cause of mammary development during pseudo-pregnancy in the rabbit, S. A. ASDELL and G. W. SALISBURY (*Amer. Jour. Physiol., 103 (1933), No. 3, pp. 595–599*).—Initiation of mammary gland development in the pseudopregnant rabbit was found in studies at the [New York] Cornell Experiment Station to originate in the ovaries, independent of coitus or ovulation as determined in several experiments. The stimulus seemed to depend on corpus luteum formation as determined by injections of pregnancy urine.

Effect of experimental hypothyroidism on period of gestation in the rabbit, B. KRICHESKY (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 8, pp. 1265–1267*).—Contrary to experiences with the pregnant female rat, it was found in studies at the University of California that thyroidectomy of the pregnant rabbit had no effect on the duration of the gestation period. The decreased oxygen consumption, together with careful microscopic examination, indicated that thyroidectomy was complete in nearly all cases.

A statistical analysis of the interrelations of litter size and duration of pregnancy on the birth weight of rabbits, J. WISHART and J. HAMMOND (*Jour. Agr. Sci. [England], 23 (1933), No. 3, pp. 463–472, pl. 1*).—An analysis of the relation between birth weights, litter size, and duration of the gestation period in three inbred strains of rabbits is reported. These results showed

that the relative influence of size of litter and gestation differs in the three strains. Regression coefficients were calculated for each. The fact that increasing the gestation period from 31 to 35 days showed little or no increase in the weight is considered to be due to the fact that in the last days of pregnancy the maternal placenta undergoes atrophy, which would tend to cut off nutrition to the embryo.

Studies in fertility in the domestic fowl, M. A. JULL (*Poultry Sci., 14 (1935), No. 1, pp. 37–41*).—Studies of the fertility of the eggs produced by the same birds as pullets and yearling hens in the flocks of the U. S. D. A. Bureau of Animal Industry showed greater fertility as pullets for the White Leghorns, Rhode Island Reds, and cross-breds, but greater fertility for yearling hens in the Barred Plymouth Rocks. The fertility of yearlings surpassed 2-year-olds in the White Leghorns and Rhode Island Reds, but Barred Plymouth Rocks as 2-year-olds were more fertile than yearlings. These differences were not great, however.

More fertile eggs were produced with cockerels than with yearlings, but one bird showed greater fertility as a 2-year-old.

A correlation of 0.19±0.05 between the fertility of 111 dams and their 196 daughters was significant and indicated that fertility was inherited.

Studies on the endocrine glands of Frizzle fowl, W. LANDAUER and S. D. ABERLE (*Amer. Jour. Anat., 57 (1935), No. 1, pp. 99–134, figs. 10*).—The results are reported by the [Connecticut] Storrs Experiment Station of the comparative live weights and weights and histology of the thyroids, adrenals, hypophysis, and gonads of male and female homozygous Frizzles and Leghorns subjected to free range and confinement. The testes of the Frizzles showed a much greater relative weight than the Leghorns, but the ovaries of the Frizzles were smaller. At hatching, the thyroids of the Frizzles showed increased activity but differences in the thyroids were observed in the reciprocal crosses between Frizzles and Leghorns. The thyroids of cross-breds with Frizzle dams were smaller and with Frizzle sires were larger. All the abnormalities of the Frizzle fowl are attributed to the defective plumage, resulting in excess loss of body heat.

Reciprocal skin transplants between normals and Frizzles showed no effect of the host on feather structure.

Relation of juvenile plumage to growth and sexual maturity, D. R. MARBLE (*Poultry Sci., 13 (1934), No. 4, pp. 195–201*).—Study of the feather development on the neck, shoulder, dorsal, pelvic wing, thigh, pectoral, and sternal feather tracts in 90 female and 73 male Single Comb White Leghorns from hatching to 20 weeks of age, at the Pennsylvania Experiment Station, showed two peaks of body molt and one complete wing and tail feather molt following the original growth of the feathers, but significant changes in growth rate did not occur during these periods.

Analyses of data on 387 pullets indicated a tendency of early-maturing pullets to carry over one or more chick feathers during the first laying year, but also indicated the impossibility of forecasting date of first egg by primary feather development at 8 or 10 weeks of age.

Interactions of gonad stimulating hormones in ovarian development, H. L. FEVOLD and F. L. HISAW (*Amer. Jour. Physiol., 109 (1934), No. 4, pp. 655–665*).—In studies at the University of Wisconsin, the influence of the follicle-stimulating and luteinizing hormones of the pituitary on the ovaries of immature rats was found to be greatly enhanced by the injection of these substances in combination. Pregnancy urine extract had a similar effect on the luteinizing hormone in combination with the follicle-stimulating hormone. It

is considered that the greater action of the combined hormones was due to separate functions performed by each hormone in sequence, and that there was no evidence of a separate synergystic factor.

An improved method for separating and purifying the follicle-stimulating and luteinizing hormones of the hypophysis is outlined.

The alleged interrelationship of the adrenal cortical hormone and the gonads, R. GAUNT and W. M. PARKINS (*Amer Jour. Physiol., 103 (1933), No. 2, pp. 511–516, figs. 6*).—Treatment of immature rats and chickens over long periods with cortical hormone produced no effect on the reproductive systems.

An improved method for determination of the gonadotropic hormone, U. J. SALMON and R. T. FRANK (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 8, pp. 1236, 1237*).—The details of an improved method for the detection of gonadotropic hormone in human blood are described, based on examination of serial sections of the ovaries of immature rats injected with the extracts.

Studies on the physiology of lactation.—II, Lactation in the male guinea pig and its bearing on the corpus luteum problem, W. O. NELSON and G. K. SMELSER (*Amer. Jour. Physiol., 103 (1933), No. 2, pp. 374–381*).—Continuing this series (E. S. R., 68, p. 181), castrate and experimental cryptorchid male guinea pigs with functional ovarian grafts or following oestrin administration were induced to lactate with the administration of extracts of the anterior lobe of the hypophysis. Luteal influence did not seem necessary for lactation.

The effects of prolonging the life of the corpus luteum in the rabbit by hysterectomy, S. A. ASDELL and J. HAMMOND (*Amer. Jour. Physiol., 103 (1933), No. 3, pp. 600–605*).—A study of the retention of corpora lutea in pregnant, pseudo-pregnant, and hysterectomized rabbits showed that corpora lutea of hysterectomized rabbits retain their size and ovulation-inhibiting function about 10 days longer than pesudo-pregnant rabbits, but 6 days less than pregnant rabbits.

The relation between the endocrine glands and the oestrus cycle.—Second report, S. TSUCHIMOTO (*Japan. Jour. Expt. Med., 13 (1935), No. 1, pp. 59–62*).—The influence of injections of emulsions of the pituitary, thymus, thyroid, suprarenal, pineal body, ovary, testes, liver, spleen, kidney, lung, and muscle from cattle on the oestrous cycle of the albino rat was studied at the Tokyo Imperial University.

Extraction of estrin from female urine after acidification with various acids, W. K. CUYLER (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 8, pp. 1352–1357*).—Studies of the influence of different acids on the extraction of oestrin from urine showed that the greatest yield was produced when tartaric acid was used, whereas smaller amounts were obtained by the use of trichloracetic, glacial acetic, hydrochloric, and sulfuric acids.

Effect of oestrin on ovaries and adrenals, H. SELYE, J. B. COLLIP, and D. L. THOMSON (*Soc. Expt. Biol and Med. Proc., 32 (1935), No. 8, pp. 1377–1381, fig. 1*).—The administration of oestrin to pregnant and lactating rats prolonged the life of the corpora lutea and, in the pregnant animals, interfered with parturition. The normal presence of oestrin during pregnancy and its absence during lactation are considered to be responsible for the differences in the ovaries, endometrium, and vaginal epithelium of normal pregnant and normal lactating rats.

Continued large doses of oestrin to adult rats resulted in an initial appearance of vaginal oestrum followed by a prolonged dioestrum with enlarged ovaries, but after three weeks vaginal oestrum reappeared and the ovaries returned to normal.

Oestrin did not lead to enlargement of the pituitary or adrenals except in the presence of corpora lutea and, therefore, did not occur in males. It

was impossible to prevent involution of the mammary gland, following hypophysectomy, by the administration of oestrin.

The general conclusion reached in these studies was that "animals whose ovaries have been depressed by oestrin treatment do not respond normally to A. P. L. administration, while on the other hand corpora lutea produced by the action of A. P. L. are enlarged by concurrent and subsequent oestrin treatment."

The continued injection of oestrin into young rats, G. PINCUS and N. WETHERSEN (*Amer. Jour. Physiol., 103 (1933), No. 3, pp. 631–636, fig. 1*).—Continued injections of oestrin into young rats caused an inhibition of ovarian growth and some thyroid hypertrophy but was without effect on the size of the pituitary.

Reactions of ant. pituitaries of male rats to administration of ant. pituitary-like substance and to oestrin, J. M. WOLFE and D. PHELPS (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 8, pp. 1305–1309*).—The comparative effects on pituitary, testes, prostate, and seminal vesicle weights and cell types in the pituitary of 10 daily administrations of follutein (an extract of the anterior pituitary lobe substance or pregnancy urine) and oestrin (progynon-B) to adult rats were studied at Vanderbilt University. The oestrin injections increased the weight of the pituitary and caused loss of granules from the basophiles and eosinophiles comparable to the combined effects of oestrin and the anterior pituitary lobe factor on normal immature female rats. Injections of the extract from pregnancy urine caused only a loss of granules from the basophiles.

The inhibition of lactation in rabbits with large amounts of oestrin, G. VAN S. SMITH and O. W. SMITH (*Amer. Jour. Physiol., 103 (1933), No. 2, pp. 356–361*).—The administration of large doses of oestrin to postpartum does inhibited milk secretion as in rabbits with retained placental remnants.

FIELD CROPS

[Field crops research in Florida] (*Florida Sta Rpt. 1935, pp. 36–42, 43–45, 46, 47, 61, 109, 114, 116, 117, 118–123, 128, 130, 136, 138, 139, 145–148, fig. 1*).—Continued progress was reported from agronomic investigations (E. S. R., 73, p. 160) at the station and substations, carried on by F. H. Hull, W. A. Carver, W. E. Stokes, G. E. Ritchey, J. P. Camp, J. H. Jefferies, W. A. Leukel, J. D. Warner, R. W. Ruprecht, A. Duane, B. A. Bourne, F. D. Stevens, R. V. Allison, R. E. Robertson, J. R. Neller, G. R. Townsend, R. R. Kincaid, H. S. Wolfe, and W. M. Fifield, and concerned with breeding work with corn, sweet corn, sugarcane, and peanuts; attempts to induce bud variations in sugarcane artificially; variety tests with corn, oats, grain sorghum, sorgo, potatoes (also seed sources), cowpeas, soybeans, alfalfa, clover, sweetclover, lespedeza, vetch, and miscellaneous forage and pasture grasses and legumes and cover crops; production tests with ramie and seed and fiber flax; fertilizer tests with corn, oats, potatoes, chufas, Dallis grass, and Napier grass; the carbohydrate fractions of field and sweet corn; response of corn to several of the less abundant elements, especially zinc; green manure studies; a study of the development and deterioration of roots in relation to the growth of pasture plants grown under different fertilizer and cutting treatments; effects of different rates and carriers of nitrogen on pasture grasses; dates and rates of planting, stage of cutting, and methods of haymaking, all with *Crotalaria intermedia;* relation of organic composition of crops, e. g., sugarcane, grasses, and forage legumes, to growth and maturity; the relation of manganese and other less abundant elements to potato yields

on glade soils; the effectiveness of treatment of potato seed tubers for control of tuber diseases; cultural tests with potatoes and chufas; preliminary stack silo experiments with surplus sugarcane; comparative production of silage crops, including corn, pearl millet, sorgo, Napier grass, and Cayana sugarcane when grown at relatively high fertility levels; cutting tests with alfalfa; seed storage investigations; methods of producing seed in the field, germination of seed after 3 yr. in storage of different types, and factors involved in seedling production, all with tobacco; corn and peanuts rotating with crotalaria and with native cover crops; and crop rotation studies with corn, cotton, crotalaria, and Austrian winter peas Pasture studies included effects of different fertilizer formulas on yields of pasture grasses; comparisons of native v. improved and burned v. unburned native pastures and of methods of preparing land for seeding; and pasture studies on peat and muck soils. Several lines of work were in cooperation with the U. S. Department of Agriculture.

[Field crops experiments in Idaho, 1935], H. W. HULBERT, H. L. SPENCER, J. TOEVS, W. H. MOSS, and R. KNIGHT (*Idaho Sta. Bul. 220 (1936) pp. 16–19, 47–49, 50, 51–53, 56–58, 59–61, figs. 7*).—Field crops research (E. S. R., 74, p. 27) reported on from the station and substations included breeding work with wheat, barley, oats, sugar beets, field peas, Ladino clover, sweetclover, and slender wheatgrass; variety tests with oats, winter and spring wheat and barley, sugar beets, alfalfa, red clover, field peas, potatoes, sweet corn strains, and miscellaneous forage grasses and legumes and mixtures; cultural (including planting) trials with field peas and brome grass; an irrigation experiment with red clover; response of field pea varieties to alfalfa in the rotation; fertilizer tests with alfalfa, wheat, and potatoes; treatment of alfalfa with gypsum; and crop rotations. Activities of the State seed laboratory are also reviewed. Certain lines of work were in cooperation with the U. S. Department of Agriculture.

[Field crops work in Michigan] (*Michigan Sta. Rpt. 1935, pp. 220, 221*).—Brief reports are given on results of breeding work with beans, oats, peppermint, corn for resistance to European corn borer, and potatoes; pasture experiments, including response to fertilizers and alfalfa and mixed pasture for poultry; cutting tests with alfalfa in relation to fall weather; sweetclover as green manure for beans; effect of preceding crops and seedbed preparation on sugar beets; and irrigation and planting tests with potatoes.

[Agronomic experiments in Montana] (*Montana Sta. Rpt. 1934, pp. 27–35, 36, 54–56, 59–64, 69–71, figs. 6*).—Accomplishments in research with field crops at the station and substations are reviewed. The several experiments and activities included breeding work with wheat and oats, and introduction, testing, and distribution of improved varieties of barley, rye, oats, and alfalfa, and crested wheatgrass; response of alfalfa, sweetclover, barley, wheat, oats, sugar beets, and potatoes to phosphorus; crop rotations on dry land and under irrigation; response of corn to continuous culture; methods of preparing and cultivating fallow; benefits of fallow in growing small grains on dry land; regrassing cultivated dry land areas by reseeding with improved grasses and grazing tests thereon; irrigated, manured pastures; classification of agricultural land; and testing of seed for purity and germination and wheat for smut dockage and protein content. Certain lines of work were in cooperation with the U. S. Department of Agriculture.

[Field crops investigations in New Jersey] (*New Jersey Stas. Rpt. 1935, pp. 14–18, 32, 33*).—Brief progress reports are made on agronomic research (E. S. R., 73, p. 170), including breeding work with corn, rye, timothy, red and alsike clover, alfalfa, and artichokes; inheritance of tolerance by alfalfa to soil conditions; variety tests with corn, wheat, oats, barley, seed flax, soybeans for grain and hay, cowpeas, red clover, and annual hay crops; increasing the

protein content of timothy by nitrogen fertilization at heading; pasture experiments concerned with the value of 22 seeds mixtures in conjunction with 8 systems of fertilization, the relation between time of liming and the response of pastures to phosphate, and management of rotated pasture; and experiments on establishing and maintaining turf.

[Agronomic research in South Dakota], A. N. HUME (*South Dakota Sta. Rpt. 1935, pp. 11–13, 14*).—Progress notes are made on field crops investigations (E. S. R., 73, p. 170), including breeding work with durum and common spring and winter wheats, barley, and oats, and effect of phosphorus on early maturity in corn.

Irrigated crop rotations in western Nebraska, 1912–34, S. H. HASTINGS (*U. S. Dept. Agr., Tech. Bul. 512 (1936), pp. 36, figs. 4*).—Results from a comprehensive series of rotation experiments conducted at the Scotts Bluff (Nebr.) Field Station on the North Platte reclamation project are reported for the period 1912–34, supplementing earlier accounts (E. S. R., 58, p. 30; 74, p. 186). The environmental conditions and technic are described and crop yields are set forth in detail.

Determination of annual fluctuations in yields for the crops showed the highest annual mean percentage (1926–34) to be 134 in 1928 and the lowest 52 in 1934. On the basis of periods, the highest percentage, 122, was for the 6 yr. 1912–17, and the lowest, 77, in the last 5 yr., 1930–34.

Oats made their highest mean yields in manured alfalfa rotations, and their lowest yields came from continuous oats and from 2-yr. untreated rotations. Sugar beet yields were the most favorably influenced by manure and by harvesting one or more crops in a rotation by livestock, whereas the increases due to alfalfa were smaller. Contrary to the results with sugar beets, alfalfa had a more favorable influence than manure on potato yields. The highest mean yields of potatoes were harvested from two 6-yr. alfalfa rotations and were followed by yields from two manured alfalfa rotations and from two 4-yr. alfalfa rotations. The lowest percentages of cull potatoes were harvested from the rotations including alfalfa and the highest from the continuously cropped plats. Due to the type of rotations, wheat yields were quite low, the highest mean yield, 27.4 bu. per acre, for the 23 yr. being harvested from a 4-yr. alfalfa rotation. Yields of corn distinctly exceeded wheat yields, the highest mean yield of corn, 55.7 bu., coming from a 6-yr. alfalfa rotation.

The comparative values of several rotations as complete units are tabulated and discussed. The highest net return came from the manured rotation devoted to sugar beets and potatoes, the chief cash crops of the area, and the next highest return was from a pastured rotation. Of the eight rotations indicating a net return of $19 or more per acre, five of them received applications of manure, one included pasturing, and the other two were alfalfa rotations.

A comparison of soil moisture under continuous corn and bluegrass sod, G. R. FREE (*Jour. Amer. Soc. Agron., 28 (1936), No. 5, pp. 359–363, fig. 1*).—Soil moisture in a 3-ft. profile under continuous corn significantly exceeded that under bluegrass sod in spite of a difference in run-off of 5.51 surface inches. This difference in available moisture could not be accounted for by greater additions to subsoil moisture below the 3-ft. profile, because the percolation under corn in the period for which percolation data from lysimeters is available was greater by 3.62 surface inches. This condition of less run-off and less soil moisture under bluegrass sod as compared with corn could only be explained by the greater evaporation and transpiration losses for bluegrass.

Varietal resistance of small grains to spring frost injury, J. B. HARRINGTON (*Jour. Amer. Soc. Agron., 28 (1936), No. 5, pp. 374–388*).—A widespread frost

occurring June 4, 1935, at Saskatoon, Sask., caught most of the cereal breeding and testing nurseries of the University of Saskatchewan when the seedlings were in the critical two-leaf stage. Highly significant differences in frost injury were found among the wheat, oat, barley, and flax varieties commonly grown in western Canada as well as in the new hybrid varieties. Certain varieties were injured badly while others showed high degrees of frost resistance. The results in different nurseries, even where they were 1,000 ft. apart, were very consistent. Susceptibility to frost was particularly noticeable in varieties having a large amount of warm-climate ancestry, whereas varieties having mostly cold-climate ancestors were frost resistant.

Combine investigations with spring wheat and oats, H. K. WILSON (In *Proceedings of the World's Grain Exhibition and Conference, Regina, Canada, 1933. Ottawa: Canad. Soc. Tech. Agr., 1933, vol. 1, pp. 468–469; abs. in Minnesota Sta. Rpt. 1935, p. 14*).—Varieties of spring wheat and of oats were grown at the Minnesota Experiment Station in rod rows during the period 1930–32, which was unusually dry, averaging 4.4 in. of rainfall below normal. Row harvests were made when the grain was considered in a proper stage for binder harvesting and at 4, 8, and 14 days thereafter, and harvested samples were threshed at once.

Each of the 14 spring wheats maintained yields throughout the 2 weeks. While most of the 12 oats varieties suffered reduction in yield, Anthony, a midseason oats, maintained its yield level throughout the trials and appeared most promising for combine harvesting. Grain quality, as evidenced by plumpness of both wheat and oats and texture of wheat, usually increased to 8 days after the normal binder harvesttime. Since moisture conditions during the period were abnormally low for the station, the results probably were more nearly typical of those expected in dry farming areas of the Dakotas, Montana, and Canada.

Pasture investigations.—VIII, Modifying the seasonal growth habits of grasses, B. A BROWN and R. I. MUNSELL ([*Connecticut*] *Storrs Sta. Bul. 209 (1936), pp. 22, figs. 7*).—The eighth of this series (E. S. R., 75, p. 332) reports the seasonal and total yields obtained, 1932–35, from variously fertilized, grazed permanent pastures and mowed plats of Kentucky bluegrass and Rhode Island bent cut when 2, 3, 4, and 5 in. high. Certain effects of the fertilizer on the chemical and botanical compositions of the herbage are also noted.

Prevalence of volunteer white clover was greatly reduced on the mowed plats by nitrogen (71 percent from ammonium sulfate and 29 from sodium nitrate), especially when applied in April, June, and August. Of the single applications, June nitrogen was the most effective in discouraging clover. Frequent cutting also retarded the spread of clover. Based on total yields, April nitrogen was about twice as effective as June or August nitrogen. The effectiveness of nitrogen decreased with repeated treatments and increased with increases in the height of the grasses when cut. June and especially August nitrogen reduced the responses to April nitrogen, but April or June nitrogen did not decrease the stimulative effects of August nitrogen. The phosphorus-potassium plats, with 38 percent of volunteer white clover, yielded nearly as much as any plat treated with nitrogen.

The seasonal habits of growth of both grasses were modified markedly by nitrogen. The usual zenith period from May 16–June 15 was postponed a month by nitrogen at 56 lb. in June, and was changed to August 16–September 15 by the same amount of nitrogen in August. April nitrogen at either 28 or 56 lb. per acre exerted most of its influence on yields before June 16 and accentuated the May–June peak. The total and seasonal yields as measured

by grazing or cutting agreed quite closely for a given fertilizer treatment. Frequent cutting leveled the seasonal, but decreased the total yields. Grass grew slowest in the period after September 15. The 3-in. cutting with nitrogen in April, June, and August produced the best lawn.

The height of cutting had more influence than nitrogenous fertilizers in changing the nitrogen content of mowed Kentucky bluegrass. Decreasing the clover in the turf with nitrogenous fertilizers resulted in a decrease in nitrogen in the herbage, especially with the higher cuts. The herbage from the grazed pastures contained appreciably more nitrogen than the mowed grass, even that cut when 2 in. high.

Need and use of potash on Vermont pastures, A. R. MIDGLEY and V. L. WEISER (*Vermont Sta. Bul. 403 (1936), pp. 18, pls. 4*).—The need of Vermont pasture soils for potash was determined by chemical soil tests (E. S. R., 72, p. 15), and plant response in greenhouse and field plat studies on the major soil types, and ways of using potash most economically were ascertained by determining potash fixation and crop growth with different rates of application. The soils involved in the several tests included Woodbridge, Berkshire, Worthington, Ondawa, Merrimac, and Colrain sandy loams; Woodbridge, Vergennes, Ondawa, and Calais clay loams; Pittsfield sandy clay loam; and Addison, Mohawk, and Vergennes clay.

While the clay soils of the Champlain Valley were about the only ones in Vermont shown by the chemical studies to have a high content of and perhaps enough potash, certain crops on these soils have shown a good response to additional potash provided clover is predominant. This seems significant because clovers need much more potash than do pasture grasses. Most Vermont pasture soils appeared able to fix much potash into unavailable forms, particularly the A_2 horizon of podzolized soils. Since colloidal silicates seem responsible for potash fixation (conversion to muscovite), and since the A_2 horizon is high in siliceous material, it may be a source of fixation in Vermont soils.

Although grasses usually responded to small applications of potash salts, e. g., 75 to 100 lb. of potassium chloride, heavier applications often resulted in decreased yields. However, pasture clovers continued to respond to each increment of potash. Since plant response to added potash depends upon the amount of white clover present, means of maintaining and increasing the growth of this desirable plant in pastures are discussed.

Growing pastures in the South, J. F. COMBS (*Chapel Hill: Univ. N. C. Press, 1936, pp. IX+270, figs. 78*).—"This book is sent forth with the hope that it may be the means of creating a greater interest in the important program of pasture improvement, and that it may furnish reliable information on how to develop pasture areas into profitable grazing lands. The author has undertaken to assemble the recommendations of experts throughout the South, based on experimental data, and to combine them with his own personal observations over a period of many years."

Practical information is given on the characteristics, adaptation, and uses of the pasture grasses and legumes; pasture establishment, fertilization, management, and utilization; inoculation of legumes and weed control; and on suitable pasture crops and mixtures for each of the Southern States.

Feeding turf grasses on lawns, parks, and recreation fields, H. B. SPRAGUE (*New Jersey Stas. Circ. 365 (1936), pp. 4*).—Popular information is given on the functions and sources of essential plant nutrients, suitable fertilizer formulas, and the most effective times and methods of applying fertilizers for turf grasses on different soils.

Phosphate for alfalfa, H. N. WATENPAUGH and G. STATEN (*New Mexico Sta. Bul. 239 (1936), pp. 8, fig. 1*).—Fertilizer tests (E. S. R., 50, p. 232) with alfalfa

on Gila clay loam, 1919–35, indicated the need of alfalfa for phosphate but not for other fertilizers. Applications of 45 percent superphosphate, 135 lb., applied each year and 180 lb. applied in alternate years, were the most profitable, considering the return per dollar invested in fertilizer and the increase in value of hay less cost of fertilizer. Where only a limited amount can be expended for phosphates, application in alternate years gives the largest return per dollar invested, although this may not give the highest economic return per acre.

Studies of the culture and certain varieties of the Jerusalem artichoke, V. R. BOSWELL, C. E. STEINBAUER, M. F. BARR, W. L. BURLISON, W. H ALDERMAN, and H. A. SCHOTH (*U. S. Dept. Agr., Tech. Bul. 514 (1936), pp. 70*).—Cultural and varietal investigations with Jerusalem-artichokes were made, 1931–33, near Washington, D. C., and at Urbana, Ill., Excelsior, Minn., Corvallis, Oreg., and Cheyenne, Wyo., in cooperation with the Illinois, Minnesota, and Oregon Experiment Stations. See also earlier notes (E. S. R., 58, p. 226; 68, pp. 321, 322).

Three of 20 varieties grown in Illinois, Oregon, and near Washington, D. C., for 3 yr., i. e., Nos. 27574, 27095, and 27007, were outstandingly superior in yield in all locations. High yielding varieties tended to be so in all locations and the converse held true, but the order of superiority was not identical. Although analyses of levulose content of hundreds of stocks and varieties made in cooperation with the National Bureau of Standards showed a high negative correlation between tuber yielding capacity and levulose content, the highest yielding variety, No. 27574, showed the highest 6-yr. mean percentage of levulose and total sugars of the 20 varieties under test.

Each successively larger seed piece from 0.25, 0.5, and 1 to 2 oz. in weight, compared in Minnesota and Wyoming and near Washington, D. C., produced successively larger net yields, while in Oregon seed pieces over 2 oz. did not outyield 2-oz. pieces. Increase in size of seed piece was consistently accompanied by increase in number of stalks per hill but not by increase in mean size of tuber harvested.

Since marked decreases in yield usually came from every planting made after the earliest one (except near Washington where April plantings did not differ significantly), the earliest possible planting is advised regardless of variety or location. Effect of time of planting on size of tubers harvested was comparable with that on yield, i. e., if yield is depressed by delayed planting so is mean tuber size.

A slight but consistent difference was found in favor of the 4-in. planting depth over the 3-, 5-, or 6-in. depth in the humid regions. In the Wyoming tests only (irrigated) did the 5-in. surpass the 4-in. depth, and here planting depth apparently did not affect depth of stolon origin. Near Washington, D. C., however, successively deeper plantings resulted in successively greater percentages of the stolons arising from the stem below a 4-in. depth. While depth of planting did not affect size of tubers harvested, it markedly affected depth of tubers harvested near Washington, D. C. Successively deeper plantings resulted in successively deeper tuber formation. Few tubers were found below 6 in. but the percentage of total harvest that came from the 4- to 6-in. soil zone increased significantly with deeper planting.

In general, the 12-in. spacing between hills outyielded the 18-, 24-, 30-, or 36-in. plantings, while in Oregon 2-, 3-, and 4-ft. spacings yielded equally well. The 12-in. spacings produced tubers of lower mean weight than the wider spacings, but there were no differences among the others. Pending further information, spacings of 2 ft. in the row are suggested except for conditions resembling those of the Oregon tests, where 4 ft. seems adequate. The highest acre yields with plants 2 ft. apart in the rows came from the 3-ft. row distance

in all locations except Oregon, where 4-, 5-, and 6-ft. row spacings with plants 4 ft apart did not differ significantly. In all locations, as distances between hills or between rows were increased, the number and yield of tubers per hill increased.

The maximum yields of green tops were obtained by harvesting just before blossoming, and of dry matter of tops just after blossoming. Top harvesting delayed beyond blossoming resulted in great losses of both green and dry matter due to dropping of leaves and also, possibly, very marked food translocation to the tubers. Ultimate tuber yields are reduced 65 to 75 percent when tops are harvested early enough for maximum green weight, 40 to 60 percent with tops harvested for maximum dry weight, and about 30 percent with the very latest top harvest for forage of medium quality and yield. Crude fiber in the tops gradually increases in percentage of fresh weight, from the earliest probable top harvest until leaf fall begins, after which a much more rapid increase occurs. On the dry-weight basis, crude fiber remains nearly constant from the earliest harvested tops until appreciable leaf fall and then increases greatly. That satisfactory yields both of tops for forage and of tubers can be obtained from the same plants seemed improbable.

For control of volunteer growth, deep, thorough, late spring or early summer plowing after such growth is about 1.5 ft. high has been very effective, particularly if followed at once by a quick-growing hay crop to shade out the few surviving sprouts. Survivors should be hand-pulled or destroyed, incidental to the hay harvest, before tuber formation in August.

Growing the Jerusalem artichoke, V. R. BOSWELL (*U. S. Dept. Agr. Leaflet 116 (1936), pp. 8*).—The information given on the adaptation, varieties, and soil, fertility, cultural, and harvesting requirements of Jerusalem-artichokes, and the cultural recommendations are based largely on the research reported above.

Prediction of double cross yields in corn, C. W. DOXTATOR and I. J. JOHNSON (*Jour Amer. Soc. Agron., 28 (1936), No. 6, pp. 460–462*).—Results obtained in corn breeding experiments by the Minnesota Experiment Station indicated that highly significant differences in yielding ability can be found in double crosses resulting from the use of different single cross parents produced from four inbred lines. There were also indications that by the appropriate use of single cross data, the highest yielding double cross combination may be predicted.

Results from the cooperative coordinated oat breeding nurseries for 1935 and the uniform winter-hardiness nurseries for 1935–36, together with summary of data for previous years, compiled by F. A. COFFMAN (*U. S. Dept. Agr., Bur. Plant Indus., 1936, pp. 95, fig. 1*).—The yields and winter hardiness data reported were secured in cooperative studies made in 81 localities in 32 States.

Potato experiments, J. BUSHNELL, D. COMIN, and J. P. SLEESMAN (*Ohio Sta. Spec. Circ. 48 (1936), pp. 60–66, figs. 3*).—The potato studies reviewed briefly dealt with the merits of standard and new varieties and of Ohio potatoes for seed; dates of planting and type of sprouting of seed potatoes; exposure of cut seed; size of seed; response to manure and to aeration of soil; corn and rye as green manures; depth of rooting of potatoes; and variety, cultural, fertilizer, and irrigation experiments with potatoes on muck soil.

Grain sorghum production relative to planting date and row spacing, H. H. FINNELL ([*Oklahoma*] *Panhandle Sta., Panhandle Bul. 60 (1936), pp. 19*).—The stands, total dry matter, and grain yields are reported for 10 grain

sorghum varieties grown on Richfield silt loam at Goodwell, Okla., planted late in May and early and late in June in 3.5- and 7-ft. rows during the period 1924–33. Field conditions prevented planting at certain times in several years See also a previous note (E. S. R., 69, p. 514).

Spur feterita averaged one-fourth stand when planted in May and about one-half stand in June, while hegari averaged slightly better from these plantings. Desert Bishop produced slightly over one-half stand when planted in May and from two-thirds to three-fourths stand planted in June. Dwarf Yellow milo averaged slightly better stands as the season advanced. Pink kafir and the Fargo, Beaver, and Double Dwarf milos showed little consistent difference in stands secured from different planting dates. The average stand of darso at different dates was very consistent throughout the planting season. The stands for the 10 varieties for the 3 plantings averaged 64, 78, and 70 percent, respectively.

The total yield increased with lateness of planting to the late June date for Dwarf Yellow milo, darso, Spur feterita, and Desert Bishop, and decreased for Pink kafir. The highest total yield was produced from early June planting by Dawn kafir and hegari. Slightly irregular relations of total yield to planting dates were noted for Dawn kafir and the Fargo, Beaver, and Double Dwarf milos. The percentage of total yield produced as grain was consistently higher for Pink and Dawn kafirs, darso, Desert Bishop, and Fargo milo in wide-spaced rows, but the highest grain yield from wide spacing was made only by darso and Pink and Dawn kafirs, 3 varieties for which early June also was the most favorable planting date. The highest grain yields came from 3.5-ft rows planted in early June for Desert Bishop and Fargo milo and from 3.5-ft. rows planted in late June for Spur feterita and the Dwarf Yellow, Fargo, Beaver, and Double Dwarf milos. In grain production, darso, Dawn kafir, and Desert Bishop were relatively unaffected by variation in planting date and row spacing. The fact that the Dwarf Yellow, Beaver, and Double Dwarf milos and Pink kafir appeared to be rather sensitive to these factors indicated that best results depended upon the accurate placement of planting date and control over the stands obtained.

The time of planting most suitable for maximum grain production was a date as late as possible to allow the variety adequate time to mature before frost. Wide spacing as a systematic practice produced a larger average grain yield only from tall-growing relatively late-maturing varieties seldom used for grain production because of their low yield.

Variety tests of sugarcanes in Louisiana during the crop year 1933–34 and summary of annual results 1926–34, G. ARCENEAUX, I. E. STOKES, and C. C. KRUMBHAAR (*U. S. Dept. Agr. Circ. 395 (1936), pp. 31, figs. 3*).—Sugarcane variety tests with commercially grown and new varieties (E. S. R., 73, p. 472) were made in the crop year 1933–34 and included plant cane and first and second stubble tests on light and heavy soils, plant cane and first stubble on muck soil and fiber determinations. A summary of annual results obtained, 1926–34, is also presented. Many of the data largely confirm conclusions drawn from previous tests.

"There appears to be no reason for the continued extensive cultivation of the varieties P. O. J. 36, P. O. J. 36–M, P. O. J. 213, and P. O. J. 234. Co. 290 has consistently surpassed, by extremely wide margins, yields of sugar per acre obtained with either P. O. J. 36, P. O J. 36–M, or P. O. J. 213 and has proved rather consistently superior to all of them in yield of sugar per ton of cane. The results of all tests now available indicate that C. P. 28/19 will be a much more satisfactory variety than P. O. J. 234 for early milling. C. P. 807 and

Co. 281 have also demonstrated qualities generally superior to those of P. O. J. 36, P. O. J. 36–M, and P. O. J. 213."

Previous estimates of C. P. 28/19 were fully confirmed. The extremely high yields of sugar per ton of cane and generally satisfactory yields of plant cane and first and second stubble render it very valuable for Louisiana cultivation in general, and particularly for early milling. Its superiority to P. O. J. 234 in yield of sugar per ton of cane at any harvest date was demonstrated conclusively. It has quite generally given sugar yields per acre exceeding comparable yields from C. P. 807. Indications were that C. P. 28/19 will be satisfactorily adapted to conditions presenting difficult maturity problems, as on reclaimed muck soils and on the Red River and Atchafalaya bottom soils in central Louisiana. C. P. 28/11 appears to be definitely inferior to C. P. 28/19 in yield of sugar per acre and per ton of cane. The merits of other recent canes are also discussed briefly.

The effect of nitrogen on cane yield and juice quality, U. K. Das and A. H. Cornelison (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *40 (1936), No. 1, pp. 35–56, figs. 12*).—In a preliminary study, 1933–35, of the effect of nitrogen fertilization on the yield and composition of sugarcane, low, medium, and high levels of nitrogen, i. e., 133, 266, and 645 lb. per acre, respectively, supplied by ammonium sulfate, and each supplemented by phosphoric acid 200 lb. from superphosphate and potash 200 lb. from potassium sulfate, were applied to H 109 cane grown outdoors in plats at Honolulu. See also an earlier note (E. S. R., 71, p. 769).

Increase in nitrogen application was accompanied by increases in tiller production, leaf and joint formation, elongation, cane tonnage (which may be lessened by top mortality), lodging, succulence (water content), reducing sugars, nitrogen content of tissue, and electrical conductivity of juice, and by decreases in sucrose. The highest amount of sucrose was obtained from moderately high application of nitrogen, as in the medium levels. "Increasing applications of nitrogen appear first to increase the salt absorption by the plants, the increased salt content probably causing greater water content or succulence of tissue. The greater water content has a diluting effect on juice resulting in a lower concentration of sucrose. This increased water content may even favor the storage of sugars such as glucose at the expense of sucrose."

Nitrogen nutrition of sugar cane, U. K. Das (*Plant Physiol., 11 (1936), No. 2, pp. 251–317, figs. 23*).—A more technical account of the above research.

Selection of open-pollinated timothy, M. W. Evans (*Jour. Amer. Soc. Agron., 28 (1936), No. 5, pp. 389–394, figs. 4*).—Certain features of the timothy breeding investigations by the U. S. D. A. Bureau of Plant Industry, cooperating with the Ohio Experiment Station at North Ridgeville, Ohio, are described. The high variability in commercial timothy has made possible by continuous selection through several generations the development of strains having longer stems, earlier or later maturity, and better retention of green color in the leaves than the plants from which they were derived. The plants of many of these new strains, e. g., Huron (E. S. R., 70, p. 179), show a high degree of uniformity even though grown under natural conditions permitting open pollination.

Sowing timothy in thin alfalfa stands, C. J. Willard (*Ohio Sta. Bimo. Bul. 181 (1936), pp. 93–95*).—Timothy sown in thin alfalfa meadows at the rate of about 5 lb. per acre after the last fall cutting, either by drilling without other preparation or by preparing a seedbed with the spring-tooth harrow or disk and then broadcasting or drilling the seed, has increased decidedly the amount of hay at the first cutting and decreased the percentage of weeds present.

Hairy vetch in Ohio, C. J. WILLARD (*Ohio Sta. Bimo. Bul. 181 (1936), pp. 87–92, figs. 3*).—The merits and uses of hairy vetch in Ohio are discussed, with recommendations for growing vetch in mixtures with wheat and rye for hay or green manure and alone for seed production, based on results of planting and harvesting tests and protein determinations made at Columbus since 1919.

Tensile strength, extensibility, and other characteristics of wheat roots in relation to winter injury, C. A. LAMB (*Ohio Sta. Bul. 568 (1936), pp. 44, figs. 7*).—Studies on the size, breaking tension, and extensibility of the roots of 15 varieties of winter wheat were carried on at the station and at Cornell University. Attention also was paid to the number and characteristics of roots and the influence of the soil fertility level. The data were analyzed in efforts to correlate winter behavior with the physical measurements and thus to indicate a basis upon which to discard undesirable lines early in the breeding program and to conserve valuable material.

Size of root, which may be related to strength and to resistance to desiccation, is considered of importance. Extensibility of roots varies among varieties, the more heaving-resistant having the greater stretching capacity. Breaking tension of the root is held very important because it may be sufficient to prevent root breakage so near the surface when the crown is actually pulled up by frost action. In soils with very large capillary pores, where undercooling is only slight, strong roots actually may prevent the heaving up of the crown. Other factors which may have a part in determining reaction to heaving are the number and type of roots, whether they are profusely branched or not and at what distance below the surface branching begins, as well as size of cells in the vascular tissue and the proportion of vascular system to cortex.

Tests on plants grown at different fertility levels indicated that the total development and also the type of development may be influenced by the supply of nutrients and the ratios existing among the elements, especially available nitrogen, phosphorus, and potassium. In any case, well-developed, vigorous plants in the fall evidently are essential to maximum resistance to spring heaving injury. Indications were that varieties differ markedly in their ability to continue growth at a relatively high rate as conditions become increasingly adverse with approach of winter. Cold-resistant wheats stop growth first, whereas varieties most resistant to heaving continue to grow longest.

A definite antagonism is evident between cold resistance and heaving resistance, although there has been no indication that, for Ohio conditions at least, a wheat could not be developed that would be cold resistant enough to withstand ordinary winters and at the same time be highly resistant to heaving. Gladden does not fall far short of this ideal.

The ranking of the several varieties on winter behavior is discussed in the light of opinions of workers in other States. Purplestraw, well adapted farther south, lacks cold resistance when grown in Ohio. It has heaving resistance but lacks the ability to survive low temperatures and has found its place in regions where wheat is seldom killed by cold. Leap and Red May probably belong to the same group. Minhardi and Kharkov, very resistant to low temperatures but readily injured by heaving, are adapted to the Great Plains where winter temperatures are severe and heaving injury is practically nonexistent because of soil moisture conditions. The newer varieties, adapted to the region in which developed, have size and strength of root proportional to the probability of heaving damage, as indicated by weather data. Cold resistance is likewise sufficient for the particular location.

Although considered as preliminary in certain respects, the studies are held to indicate that "certain root measurements vary markedly with variety and with the resistance of the variety to cold and to heaving injury. Observations combined with the results of the experiments further indicate that no one characteristic of the roots alone is an entirely satisfactory measure of ability to resist heaving, and that a number of attributes not studied as yet may have considerable significance in determining behavior. The environment in which the wheat develops in the fall, both as regards soil and climate, has a profound influence on the degree of resistance to heaving. Varietal differences are largely independent of environment. The combination of resistant variety and favorable fall environment is essential to reduction of injury from heaving to a practical minimum."

Proceedings of the Association of Official Seed Analysts of North America, 1929 (*Assoc. Off. Seed Anal. North Amer. Proc., 22 (1929–30), pp. 51, pls. 2, fig. 1*).—A report of the activities of the association during 1929 and of the twenty-second annual meeting at Des Moines, Iowa, from December 31, 1929, to January 2, 1930. The following papers by station and U. S. Department of Agriculture workers are included: A Need of Our State Seed Testing Services, by F. S. Holmes (pp. 27–29) (Md.); Seed Law Enforcement, by H. R. Kraybill (pp. 30–34) (Ind.); Preliminary Report on the Viability of Hard Seed of Legumes Which Have Remained in Soil, by W. O. Whitcomb (pp. 35–38), and Impurities Commonly Found in Montana Grown Alfalfa Seed, by W. D. Hay (pp. 39–42) (both Mont.); and Preliminary Results of Soil Tests of *Agrostis* spp., by C. C. Thygeson (pp. 43–46), and A Suggested Method of Seed Testing, by A. F. Musil and M. E. Lyon (pp. 47–50) (both U. S. D. A.).

Proceedings of the Association of Official Seed Analysts of North America, 1935 (*Assoc. Off. Seed Anal. North Amer. Proc., 27 (1935), pp. 130, pls. 3, figs. 2*).—A report of the activities of the association during the year ended June 1935, and of the twenty-seventh annual meeting at St. Paul, Minn., June 27–29, 1935, inclusive. The following papers by State experiment station, U. S. Department of Agriculture, or workers from other agencies are included: Development of Seed Testing in the United States (pp. 35–39) and Germination of Fordhook Lima Beans (pp. 52–55), both by W. L. Goss, and Retarded Germination of *Hypericum* Seed Caused by Tap Water, by H. A. Borthwick (p. 124) (all Calif.); Seedling Identification (pp. 40–43) and Misbranded Seed in Interstate Commerce and Seed Analysis (pp. 108–112), both by W. A. Davidson, and The Influence of Storage Conditions on the Viability of Soybean Seed, by E. H. Toole and W. A. Davidson (pp. 125, 126) (all U. S. D. A.); An Improved Method of Testing Seeds of Kentucky Blue Grass (*Poa pratensis* L.), by E. O. Brown and R. H. Porter (pp. 44–49), Germination of Seeds of Black Locust (*Robinia pseudacacia* L.) (pp. 63–65) and Effect of Seed Borne Pathogens and of Seed Disinfectants on the Germination of Barley Seed (pp. 94–99), both by R. H. Porter, and Laboratory Detection of Smut in Oats, by G. N. Davis (p. 93) (all Iowa); Time Required for Analyzing Sweet Clover Seed Samples, by R. U. Croulcy (pp. 50, 51), Preliminary Work on Germination of *Agropyron* Caryopses, by L. M. Stahler (pp. 56–59), and The Weed Control Program, by C. P. Bull (pp. 117–120) (all Minn.); The Favorable Influence of a Moist Substratum for the Germination of Seeds (pp. 60, 61) and Some Suggestions for Testing the Viability of Hard Seeds (p. 62), both by A. L. Shuck, Further Work With Soil for Testing the Vitality of Seeds (pp. 78, 79), and Five Years' Experience With Control Fields as a Part of the Equipment of a Seed Testing Station (pp. 80, 81), both by M. T. Munn, *Ascochyta pisi viciae* in Seeds of Vetch (pp. 82–86) and Detection and Identification of Seed Borne

Parasites (pp. 87–92), both by W. F. Crosier, and The Quality of Flower Seeds Upon the New York Market, by M. T. and R. E. Munn (p. 100) (all N. Y. State); Germination of Crested Wheat Grass (*Agropyron cristatum*): Preliminary Studies, by W. D. Hay (pp. 66–70), and Interpretation of Germination Results: Transfer of Germinated Seeds From Blotters to Field Soil (pp. 73–77) and The Young Seed Analyst: His Training, Ideas, and Future (pp. 121–123), both by W. O. Whitcomb (all Mont.); The Frosted Oat Problem, by B. F. Forward (pp. 71, 72) (Alta.); Purity and Germination Tolerances Fundamentally the Same Problem, by C. W. Leggatt (pp. 101–107) (Ont.); and The Uniform Seed Label, by C. E. Buchanan (pp. 113–116) (Kans.).

HORTICULTURE

[Horticultural studies by the Florida Station] (*Florida Sta. Rpt. 1935, pp. 60, 61, 63, 74–84, 98, 99, 106–109, 140–145, 148*).—Among studies the progress of which is discussed are sources of potash for citrus, effects of various potash and nitrogen sources on the composition of citrus trees and fruits, and concentrated fertilizers for citrus, all by R. W. Ruprecht; fertilizers for pecans, by H. W. Winsor; fertilizer needs of celery, by E. R. Purvis and Ruprecht; cover crops for pecans, zinc requirements of the pecan, fertilizers for the pecan, and variety tests of pecans, all by G. H. Blackmon; propagation, planting, and fertilizer trials with tung-oil trees, effects of mulching on citrus, and effects of zinc on tung trees and citrus, by A. F. Camp; winter injury of introduced shrubs and ornamentals, and relation of nitrogen absorption to food storage and growth in the pecan, both by Camp and Blackmon; variety tests of potatoes, lettuce, and other vegetables, by F. S. Jamison; variety tests of minor fruits and ornamentals, by Camp and H. S. Wolfe; cold storage studies with oranges and grapefruit, by Camp and A. L. Stahl; and citrus maturity as indicated by sugar and acid, by Stahl.

Studies carried on at the Citrus Experiment Station included propagation experiments with citrus, by J. H. Jefferies. At the Everglades Experiment Station there were conducted studies of varieties of fruits, tung trees, and ornamentals, by R. V. Allison, G. R. Townsend, and R. N. Lobdell, and fertilizer tests with truck crops, by Allison, A. Daane, R. E. Robertson, and F. D. Stevens. Studies at the Subtropical Experiment Station dealt with tests of minor fruits and ornamentals as to hardiness, and fertilizer experiments with mangoes, both by Camp and Wolfe; cultural studies with avocados, and rootstocks for Persian limes, both by Wolfe; and fertilizers for tomatoes and tomato variety tests, both by Wolfe and W. M. Fifield.

[Horticultural studies by the Idaho Station], H. P. Magnuson and L. Verner (*Idaho Sta. Bul. 220 (1936), pp. 9, 36, 37–39, fig. 1*).—There are discussed various activities, including the removal of residues from apples, the breeding of apples, the fertilization of apple, prune, and cherry trees, testing of new fruits, factors involved in the cracking of sweet cherries, and the low-cost production of fruit juice concentrates from surplus and cull fruits.

[Horticultural studies by the Montana Station] (*Montana Sta. Rpt. 1934, pp. 35, 36, 56–59, 64, 65*).—Among projects discussed are those relating to fertilizer and cover crop experiments with the apple and cherry, the testing of raspberry varieties, the culture of tomatoes, control of strawberry yellows, testing of strawberry varieties, testing of broadleaf and conifer species for shelterbelts, and the testing of various ornamental shrub and iris varieties.

[Horticultural studies by the New Jersey Stations] (*New Jersey Stas. Rpt. 1935, pp. 23, 24, 46–57, 58–62, fig. 1*).—Among experiments the progress of which is reviewed are fertilizer, cultural, and propagation studies with the

blueberry; fertilizer and breeding studies with the cranberry; control of cranberry and blueberry pests; winter injury to peach; peach breeding; peach propagation; rootstocks for peaches; apple breeding; growth status of apple trees; performance of Delicious apple spurs of different sizes; breeding of strawberries; testing of varieties of small fruits; winter injury to grapes and other small fruits; culture of raspberries; effect of soil reaction on the strawberry; tomato breeding; asparagus breeding; variety testing of tomatoes, sweet corn, and peppers; effects of high nitrogen supply and temperature on the setting of string and lima beans; response of vegetables growing in highly acid soils or in soils of low available calcium to application of soluble calcium salts; the relation of salt concentration in the nutrient solution to sterility of greenhouse plants, such as the tomato; sand culture of roses, poinsettias, and sweet peas; effects of temperature on growth, anatomy, and metabolism of apple and peach roots; the metabolism and bud abscission of the sweet pea; and a new washing method for removing spray residue.

[Horticulture at the Ohio Experiment Station], J. H. GOURLEY ET AL. (*Ohio Sta. Spec. Circ. 48 (1936), pp. 1–59, figs. 13*).—Information is presented on recent experimental activities in the fields of pomology, ornamental horticulture, and olericulture.

[Horticultural research papers] (*Assoc. South. Agr. Workers Proc., 35 (1934), pp. 309, 310, 312, 313, 315–317, 321–326; 36 (1935), pp. 476, 477, 555, 556, 559–564, 567–569*).—The following subjects were presented at the thirty-fifth and thirty-sixth annual conventions of the Association of Southern Agricultural Workers: Propagable Vegetative Variations in Relation to Crop Improvement, by B. D. Drain (pp. 309, 310); The Germination of Strawberry Seeds and the Technic of Handling the Seedlings, by E. M. Henry (pp. 312, 313); A Physiological Study of Fruit Development in the Pecan (*Hicoria pecan*), by C. L. Smith and C. J. B. Thor (pp. 315, 316); Further Studies on Periods of Receptivity and Pollen Viability in the Pecan, by C. L. Smith and L. D. Romberg (pp. 316, 317); The Influence of Planting Depth on the Shape of the Scarlet Globe Radish, by J. B. Edmonds (pp. 321–323); Yield Relationships on Terminal Growths in York Imperial Apples, by F. W. HofMann (pp. 323–325); Physiological and Chemical Studies of Grapes, by F. B. Cross and J. E. Webster (pp. 325, 326); The Effect of Copper Sulfate on the Yield and Quality of Oranges, by W. E. Stokes (pp. 476, 477); Uniformity Trials with Asparagus and Peach Plots, by L. E. Scott (pp. 555, 556); Newer Strains and Varieties of Vegetables Recently Tested in the Southern States, by F. S. Andrews (pp. 559–561); Some Factors in Peach Tree Longevity in Some Sections of Georgia, by W. D. Armstrong (pp. 561, 562); The Effect of Fertilizers on Elberta Peach Fruits, by M. M. Murphy, Jr. (pp. 562, 563); Abstract of Fall Fertilization of Peach Trees, by C. F. Williams (p. 564); Some Relations of Male Vines to the Bearing of Muscadine Vines, by W. D. Armstrong (p. 567); and Disbudding in the Nursery Row as a Possible Means of Improving the Frame Work of Apple Trees, by C. B. Wiggans (pp. 568, 569).

Fruits and vegetables in ripening and blanching produce ethylene, R. C. NELSON and R. B. HARVEY (*Minn. Hort., 63 (1935), No. 6, p. 105; abs. in Minnesota Sta. Rpt. 1935, p. 47*).—As indicated by the peculiar effect of ethylene in causing the drooping of tomato leaves, the gases given off by Golden Self-Blanching celery were found to contain ethylene. On the other hand the green Winter Queen celery not in a blanching condition did not give off the gas. Since ethylene production is a natural phenomenon associated with various fruits and vegetables, the authors believe that its use in hastening maturity cannot be considered harmful.

Shrivelling of fruits and vegetables, R. B. HARVEY and R. H. LANDON (*Market Growers Jour., 56 (1935), No. 7, pp. 155, 158, figs. 2*).—In this further contribution from the Minnesota Experiment Station to the general subject (E. S. R., 74, p. 199), the authors present additional information on tomatoes and also some data on squashes, apples, and melons. Coating Buttercup squashes with water wax was particularly effective in cutting down water losses in storage. Water wax required brushing to produce a polished surface. Another type of material containing shellac became slightly sticky under high humidities and was not as desirable. No evidence of smothering was shown by apples or squashes treated with either material. In the case of muskmelons there was indicated an accumulation of moisture in the outer part of the rind under the wax, thus favoring the growth of fungi.

Diseases and insect pests of cabbage and related plants: Identification and control, L. H. SHROPSHIRE and K. J. KADOW (*Illinois Sta. Circ. 454 (1936), pp. 47, figs. 21*).—This is a presentation of general information.

Experiments with rapid chemical soil tests for vegetable crops, J. B. HESTER (*Amer. Soc. Agron., Com. Fert. Proc., 1 (1935), pp. 78–85, figs. 3*).—The results are presented of experiments at the Virginia Truck Experiment Station upon various rapid tests for pH, replaceable calcium, organic matter, phosphorus, magnesium, and potash.

Acid-neutral fertilizers in vegetable crop production in eastern Virginia, J. B. HESTER and H. H. ZIMMERLEY (*Amer. Soc. Agron., Com. Fert. Proc., 1 (1935), pp. 38–43, pl. 1, figs. 4*).—Studies by the Virginia Truck Experiment Station upon the use of dolomitic limestone of different degrees of fineness added to the fertilizer mixture as compared with the use of neutral salts and commercial fertilizers based down with dolomitic limestone for crops growing on a Sassafras sandy loam of pH 6.2 indicated that the degree of fineness of limestone influences greatly the rapidity with which the calcium neutralizes the acidity of the soil. Rock phosphate was not effective in neutralizing the acidity developed from the sulfate of ammonia. Dolomitic limestone of the same fineness but of different origin had different degrees of activity in the soil.

Vegetable variety tests at the Scottsbluff Substation, L. HARRIS (*Nebraska Sta. Bul. 300 (1936), pp. 27, figs. 2*).—In addition to presenting the results of variety tests extending over the 5 yr. 1931–35 and including most of the important species, information is presented on culture, irrigation, desirable rotations, and the arrangement of vegetables in the home garden.

Floral biology and morphology of the eggplant, M. V. MAGTANG (*Philippine Agr., 25 (1936), No. 1, pp. 30–53, pls. 5, fig. 1*).—In this discussion of the development of the flower, gametophytes, fruit, and seed the author points out that eggplants require pollination to set fruit and that plants are both self- and cross-fertile.

Fertilizing onions on muck soils, J. E. KNOTT ([*New York*] *Cornell Sta. Bul. 650 (1936), pp. 20, fig. 1*).—Fertilizer experiments carried on over a 5-yr. period on three widely separated muck areas which had been under cultivation for different periods showed that the duration of the period under culture is the most important consideration in developing fertilizer practices.

On one area cultivated only 3 yr. prior to the experiment the use of nitrogen actually decreased the yield as compared with no nitrogen, the odds being 30:1 that no nitrogen was better than 70 lb. The maximum application of phosphoric acid (192 lb.) was needed for maximum yields, and during the first 4 yr. 195 lb. of potash per acre gave significant increases over lesser quantities.

On a muck tilled for 20 yr. all the nitrogen treatments gave increased yields. Plats receiving no phosphoric acid yielded better than those receiving 64 or

192 lb. per acre, and the phosphorus had no visible effect on the ripening of the onions.

On muck tilled for 30 yr. but not fertilized as liberally or consistently as the other old mucks nitrogen in all amounts proved effective, and phosphoric acid both in 64- and 128-lb. applications increased yields. Potash, however, failed to give any significant increases.

On a muck cultivated for 56 yr. none of the fertilizer treatments had any significant effect, but, since the initial reaction of the soil was below pH 5.2, the author suggests that the low pH value may have interfered with fertilizer effects.

In general conclusion the author points out that fertilizer plat work with muck crops is difficult, due to previous treatments and to differences in drainage, prevalence of insects and disease, and the stand. He presents practical recommendations for fertilizing mucks of different cultural ages.

The anatomy and histology of the transition region of Tragopogon porrifolius, L. HAVIS (*Ohio State Univ., Abs. Doctors' Diss., No. 17 (1935), pp. 229–234*).—Herein are presented in abstract form the results of a study with salsify (E. S. R., 74, p. 759).

Effects of light on carotenoid formation in tomato fruits, O. SMITH ([*New York*] *Cornell Sta. Mem. 187 (1936), pp. 26, pl. 1, figs. 30*).—Using largely the Bonny Best variety, the author found that greenhouse-grown tomato fruits did not contain as large a quantity of carotenoid pigments as did fruits produced out of doors. When early growth took place under the same light conditions the carotenoid content of both the skin and flesh of tomato fruits ripened in light was higher than that of fruits ripened in the dark. To secure the maximum carotenoid content the fruits should be ripened on the vine in full exposure to light. With reference to the quality of light it was observed that wave lengths approximating 5,400 to 5,800 a. u. were not conducive to the maximum production of carotenoid pigments, but that some of the longer and shorter wave lengths were favorable. There was some indication of a possible transfer of carotenoids or carotenoid-producing substances from the plant to the fruit.

The results of quantitative determinations of carotenoids in fruits grown under different light conditions, as well as of microscopic studies of pigments, indicated that protection from intense light favors lycopene formation. The presence of lycopene in mature fruits which had been grown in complete darkness is believed to indicate that lycopene cannot be an oxidation product of chlorophyll as has been suggested by other workers. Lycopene was not found in plastids and occurred only in crystalline or semicrystalline form. Carotene was found in granular form both inside the plastids and after their decomposition, and its was also found in crystalline and globular forms. Plastids of mature green fruits were smaller and less numerous in tomatoes grown in the absence of light than those grown in normal light. The color of Bonny Best fruits developed in normal light is believed due to the lycopene in the skin and flesh, the carotene in the skin and flesh, and to an unidentified pigment in the walls of the epidermal cells.

[Plant improvement activities of the South Dakota Station], N. E. HANSEN (*South Dakota Sta. Rpt. 1935, pp. 34, 35*).—Brief mention is made of crossing experiments with apricots and apples.

Orchard cover crops, O. M. MORRIS (*Wash. State. Hort. Assoc. Proc., 31 (1935), pp. 65–67*).—Pointing out that neither alfalfa nor sweetclover have become perennial cover crops in Washington orchards because of light seed production under orchard environments and because of disking and other cultural operations, the author suggests the need in many orchards of returning

to clean tillage for a period of from 1 to 3 yr., relocating the irrigation ditches to secure a wider distribution of apple roots, and finally reseeding to establish good cover crops.

The apples of England, H. V. TAYLOR (*London: Crosby Lockwood & Son, 1936, pp. 266, pls. 9*).—Devoted principally to the description of varieties grown in England, this monograph discusses the characteristics that distinguish varieties, presents a historical account of the development of British apples, gives information on their uses for dessert, culinary, and cider-making purposes, and includes other related facts.

Fertilizer needs of red raspberries, A. E. STENE (*Better Crops with Plant Food, 20 (1936), No. 9, pp. 12–14, 39–41, figs. 2*).—At the Rhode Island Experiment Station it was found that on two different soils of fair fertility red raspberries showed a very definite response to potassium, with nitrogen second and phosphoric acid third in order. Under conditions in which a complete fertilizer produced an average yield of 2,845 qt. per acre over a 3-yr. period, N–K produced 2,600 qt., P–K 1,816, and N–P 1,294 qt.

Results with fertilizers on the red raspberry, W. J. STRONG (*Sci. Agr., 16 (1936), No. 8, pp. 424–439, pl. 1, figs. 3; Fr. abs., p. 439*).—Records taken at the Ontario Horticultural Experiment Station, Vineland, over a period of 3 yr. on the yields of Viking red raspberries fertilized with nitrate of soda, superphosphate, and sulfate of potash showed definitely beneficial effects from the nitrogen and potash materials but nonsignificant results from phosphoric acid. At the beginning of the experiment the top 1 to 8 in. of soil had a pH of 6.5 and was found well supplied with available phosphorus but rather low in replaceable potassium. No evidence was seen of interactions between nitrate of soda, superphosphate, and sulfate of potash in the various combinations.

Nutrition of blueberry (Vaccinium corymbosum L.) in sand cultures, O. A. DONEHLEET and J. W. SHIVE (*Soil Sci., 41 (1936), No. 5, pp. 341–350*).—Using root cuttings of the Rubel blueberry grown in sand cultures supplied with different nutrient solutions by the continuous drip method, the authors found that the most favorable solutions were those low in phosphate and high in nitrogen. The results were thus in close agreement with earlier information obtained in the field (E. S. R., 70, p. 780). The superiority of nitrate nitrogen over ammonium nitrogen is explained on the basis of a pH of about 4.5 of the nutrient solutions. Many of the plants made excellent growth and yielded crops comparable with those secured in the field. The lack of boron and manganese resulted in definite deficiency symptoms in relatively short periods.

Effect of nitrogen fertilizers on strawberry production, R. A. LINEBERRY and H. B. MANN (*Jour. Elisha Mitchell Sci. Soc., 51 (1935), No. 2, pp. 209, 210*).—Source of nitrogen trials indicated that the type of soil to which materials are applied is a potent factor in results. Strawberries produced on plats receiving a mixture of organic and inorganic nitrogen were firmer than those from plats receiving inorganic nitrogen alone. The use of quickly soluble inorganic nitrogen resulted in low viability of plants during the summer. As regards effects on earliness and shipping quality, spring applications of nitrate of soda or ammonium sulfate in addition to complete fertilizer were injurious but in moderate quantities increased total yields.

Strawberry culture in Illinois, A. S. COLBY (*Illinois Sta. Circ. 453 (1936), pp. 52, figs. 28*).—This is a presentation of general information relating to selection of soils, choice of varieties, establishment of plantations, general management, irrigation during drought, harvesting, marketing, control of pests, etc.

Field and storage studies on changes in the composition of the rind of the Marsh grapefruit in California, E. M. HARVEY and G. L. RYGG (*Jour. Agr. Res.* [*U. S.*], *52 (1936), No. 10, pp. 747–787, figs. 14*).—Utilizing grapefruits produced in different districts of California, it was noted that environment plays an important role in the changes taking place in the rind as the fruits develop on the tree and subsequent storage. Water content showed a slight seasonal upward trend in all instances. The flavedo-albedo ratio was also affected by environment, with certain exceptions at the close of the season. Soluble solids increased throughout the growth period in all localities. Total sugar increased in two districts, Corona and Fontana, until July 23, whereas at Oasis total sugar tended to increase throughout the season. Hydrolyzable polysaccharides showed a steady relative decline throughout the season at all localities. With certain local variations naringin decreased in general through the season in all localities. The difference in composition of the stem and blossom end portions of the rind were less marked at Oasis than at other points.

On the whole the differences between flavedo and albedo tissues were smaller than in the orange but here again were influenced by environment. As to the effects of storage temperatures fruit from all three localities pitted and spotted more severely at 42° F. and least at 52°. Picking season was also a factor in spotting. The permeability of rinds to their own soluble substances increased as the storage temperature was lowered. When solutions of naringin and its derivative naringenin were injected into the albedo, the latter was approximately 1,000 times more toxic to the tissues than was naringin, and, since the spots developing in the rind after injection with naringenin resembled those in ordinary stored grapefruit, the association of this chemical with ordinary storage spotting is surmised. The temperatures that gave the greatest amount of common storage spotting were the most favorable to naringenin injury. There were noted differences between individual fruits in their susceptibility to naringenin. The results of various chemical analyses of the rinds are presented in considerable detail.

Rootstocks for the Bearss lime in California.—A progress report, R. W. HODGSON, E. R. EGGERS, and S. H. CAMERON (*Calif. Citrogr., 21 (1936), No. 8, p. 280, fig. 1*).—Observations on 7-year-old Bearss limes budded on sweet and sour orange, rough lemon, grapefruit, and trifoliate orange rootstocks showed the largest trees to be on grapefruit, with yields almost equal on grapefruit and rough lemon. Trifoliate orange markedly dwarfed the limes, and the sour orange had a similar but less potent effect. The form of the bud unions was similar in all cases, namely, an overgrowth on the part of the scion. The fruits were apparently similar except for a tendency to be smaller on the trifoliate roots. Own-rooted lime trees were larger than those on either trifoliate or sour orange.

Phosphorus relations of lemon cuttings grown in solution cultures, A. R. C. HAAS (*Bot. Gaz., 97 (1936), No. 4, pp. 794–807, figs. 6*).—Rooted Lisbon lemon cuttings grown by the California Experiment Station at Riverside in an unaerated culture solution lacking phosphate were supplied with different concentrations of phosphate added as potassium acid phosphate. Cuttings grown in solutions containing from 0 to 0.2 p. p. m showed phosphorus deficiencies regardless of the frequency of change of the solutions. Slight symptoms of deficiency occurred at 1 p. p. m. but none at 2 p. p. m. Root length was in inverse ratio to phosphate concentration. Concentrations as high as 105 p. p. m. were not harmful when vigorous aeration was provided. As contrasted to the orchard, where a decrease was noted as the leaves matured,

the percentages of phosphorus in the mature original leaves of the cuttings increased with increasing phosphate concentration. A relation was apparent also between the percentage of phosphorus in the culture solution and the percentages of sucrose in the mature leaves. Phosphate-deficient leaves had a greater acidity than healthy leaves. Percentages of total ash, calcium, potash, and total and nitrate nitrogen in the new mature leaves were greatest at the lowest concentrations of phosphate. In the absence of sufficient phosphorus the absorbed nitrates remained largely unchanged, and thus trees with abundant nitrate may be essentially nitrogen starved.

Report on a girdling test with Washington Navel orange trees, A. D. SHAMEL and C. S. POMEROY (*Calif. Citrogr., 21 (1936), No. 9, pp. 320, 343, fig. 1*).—As a result of a single girdling Washington Navel orange trees showed consistent increases in production, whereas those girdled for from two to four consecutive years produced about the same as the nongirdled trees. After 7 or 8 successive years of girdling a significant loss in production occurred, and vigor of the trees was noticeably impaired. The grade and size of the fruits were about the same from the girdled and the nongirdled trees. As indicated by the cross section of the trunk, girdling for a period of 6 successive years or more resulted in diminished growth.

Physiological changes in the rind of California oranges during growth and storage, E. M. HARVEY and G. L. RIGG (*Jour. Agr. Res. [U. S.], 52 (1936), No. 10, pp. 723–746, figs. 5*).—Seeking an explanation of the causes of certain rind spotting and pitting diseases that occur during transportation and storage, the authors investigated the changes taking place normally in the rinds of Valencia and Washington Navel oranges on the tree and during storage at different temperatures. As was expected, there were important differences between the two varieties because of their different characteristics and ripening seasons, and, although the results did not contribute much information on pitting and spotting, they are considered of significance.

Designating the outer rind as flavedo and the inner rind as albedo, it was observed that in Valencia the flavedo always weighed more than the albedo, whereas in the Washington Navel orange the ratio averaged more than unity. In the Valencia the flavedo contained a higher percentage of invert sugar, total sugar, soluble solids, and nitrogen than the albedo. In the Washington Navel the flavedo was higher in percentage of reducing sugar, invert sugar, and soluble solids. As the season progressed there was an increased water content in the rinds of Valencia oranges, with the reverse true in the Washington Navel orange. In Valencia soluble solids varied inversely with mean temperature. In the Washington Navel there was a general relative increase throughout the season. In Valencia total sugar remained practically constant but in the Washington Navel increased throughout the season. In Valencia hydrolyzable polysaccharides varied with the mean temperature, while in the Washington Navel orange they decreased as the season advanced. Hesperidin, determined only in the Washington Navel orange, decreased steadily during the season. H-ion concentration made a small but definite decrease during the season. Well-defined differences were found in the percentage composition of the stem end and blossom end of both varieties.

In storage experiments at 33° and 53° F. for 7 weeks the rind from the stem end of Valencias lost soluble solids twice as rapidly as did the blossom end. Soluble solids decreased more rapidly at 53° than at 33°, and the rinds at 33° had a higher H-ion concentration. With Washington Navels stored at 52°, 42°, and 32° there was noted increased acidity in all portions of the rind at all three temperatures, but greatest at 52°. Hesperidin increased at all three temperatures.

Late-picked Washington Navel oranges were most susceptible to brown stain, and 32° increased this susceptibility. Pitting and spotting could not be associated definitely with maturity or storage temperature.

Seedling production in Carya ovata (Mill.) K. Koch, Juglans cinerea L., and Juglans nigra L., L. V. BARTON (*Contrib. Boyce Thompson Inst., 8 (1936), No. 1, pp. 1–5, fig. 1*).—Observations on the germination of seeds of the above three species collected before frost and planted in flats in a mixture of peat, sand, and soil showed that pretreatment at low temperatures for from 2 to 4 mo. in a moist medium is necessary for seedling production in the black walnut and the butternut. Seedling production in the hickory was increased by pretreatment in moist soil for from 1 to 5 mo. at 3° or 10° C., but some seedlings were produced without this pretreatment. A period of high temperature preceding low temperature treatment had no effect on this species. Good results with all three species were secured by fall planting when the seedbeds were protected by mulch or boards from alternate freezing and thawing.

Effects of thinning the trees in a pecan orchard, M. B. HARDY, N. H. LOOMIS, and H. LUTZ (*Southeast. Pecan Growers Assoc. Proc., 30 (1936), pp. 4–9*).—In a block of Stuart trees planted 20 to the acre in 1908, a reduction in the number of trees to 10 in 1932 was compared with (1) heavy fertilization with ammonium sulfate, (2) heavy pruning, and (3) moderate fertilization (control). No cover crops were grown subsequent to 1932, and only one cultivation was given each year just prior to harvest. For the 4 yr. 1932–35 the average gains in cross sectional area of the trunk were 4.13, 4.61, 3.51, and 6.1 sq. in. for the control, heavily fertilized, heavily pruned, and tree-removal plats. The average yield in pounds of nuts per tree for the 3 yr. 1933–35 were 6.06, 10.42, 0.57, and 8.3, respectively. As indicated by these averages the yields per acre were not sufficient to offset the reduction in the number of trees. Grading showed that the heavily pruned and reduced-tree plats had produced the larger and better-filled nuts. Unfavorable moisture conditions during the period of the experiment are believed to have decreased the favorable responses from treatments.

Effects of fertilizers on the yield of pecan trees, G. H. BLACKMON (*Southeast. Pecan Growers Assoc. Proc., 30 (1936), pp. 19–25*).—A study by the Florida Experiment Station of records taken on fertilizer experiments with Curtis, Kennedy, Moneymaker, Moore, Stuart, and Success pecans showed with one exception yield increments in all the fertilized trees of each variety regardless of the nature of the treatment. The single failure was due to the presence of rosette disease. Moore, the most productive variety of the six, was a consistent annual bearer. The value of well-balanced fertilizers applied annually was indicated, with some suggestion that nitrogenous materials applied during July are beneficial in maintaining annual production.

Effect of various nitrogen fertilizers on nitrates in the soil and on pecan tree growth on Greenville sandy loam, R. D. LEWIS and E. D. FOWLER (*Southeast. Pecan Growers Assoc. Proc., 30 (1936), pp. 34–46*).—Schley trees 10 yr. old in 1932 and located on a Greenville sandy loam were uniformly treated with nitrogen, phosphorus, and potassium, except that the sources of nitrogen were different. Trees receiving nitrogen from one-third ammonium sulfate, one-third cottonseed meal, and one-third sodium nitrate made the largest increase in circumference each year, and the soil contained the highest average amount of nitrates with the most uniform distribution throughout the year. Nitrogen in the form of calcium nitrate, sodium nitrate, cyanamide, and Calurea tended to decrease the soil acidity, whereas ammonium sulfate and Ammo-Phos produced additional acidity.

A cover crop program for Florida pecan orchards, G. H. BLACKMON and R. M. BARNETTE (*Florida Sta. Bul. 297 (1936), pp. 44, figs. 20*).—Suggesting that many plantings have been made in Florida on soils different from those in the regions where the pecan is native and that one of the major problems is to maintain sufficient growth in the older trees, the authors discuss the results of cover crop experiments begun in 1927 in an orchard of Frotscher and Stuart varieties in which the trees were low in vigor and production was at a minimum. Beneficial results both in growth and yield were obtained with leguminous cover crops, and, while the response was greater where complete fertilizers were used with the cover crops, there were no significant differences until the cover crops had been grown for 4 yr. The combination of hairy vetch and *Crotalaria spectabilis* produced the greatest amount of green material containing the most nitrogen, followed closely by an Austrian pea and *Crotalaria* combination. Oats in winter and *Crotalaria* in summer failed to increase production. The Frotscher variety produced much heavier crops than Stuart and consequently gave more profitable returns for the treatments. There were no significant differences in the size of nuts and kernel percentages on the several plats.

An examination of the surface soil showed an increased nitrogen content where cover crops were planted and a decrease when only the natural growth of native nonlegumes was present. Organic matter content increased slightly on two of the cover crop plats. In conclusion suggestions are presented for the planting of both winter and summer legumes with recommendation for checking the summer cover crop by disking during dry periods. A broadcast application of from 200 to 300 lb. of superphosphate and from 50 to 60 lb. of sulfate of potash is suggested before seeding the winter legumes, supplemented in June and July with from 5 to 20 lb. of ammonium sulfate or nitrate of soda per tree, depending on their size.

Roses, E. R. HONEYWELL (*Indiana Sta. Circ. 216 (1936), pp. 16, figs. 13*).—General information is presented on species, varieties, propagation, pruning, cultural requirements, winter protection, and the control of various insect and fungus pests.

FORESTRY

The Cloquet Forest: A demonstration of practical forestry in northern Minnesota, T. S. HANSEN, J. H. ALLISON, R. M. BROWN, E. G. CHEYNEY, and H. SCHMITZ (*Minnesota Sta. Tech. Bul. 112 (1936), pp. 84, figs. 49*).—Beginning with an account of the location, environment, and establishment of the forest, the authors discuss the present composition of the forest flora, management plans under which the forest is operated, growth rates and production, and possibilities of sustained yield, and present various area, stock, and growth tables based on measurements taken in the forest. An appendix sets forth the silvical characteristics of the important species, namely, jack, Norway, and white pines, aspen, birch, balsam fir, black spruce, tamarack, and white cedar.

Ohio Forest News, [July 1936] (*Ohio Forest News [Ohio Sta.], No. 28 (1936), pp. 8, figs. 2*).—General notes are presented with reference to State forests, Dutch elm disease, conservation matters, reforestation, etc.

Germination of Populus grandidentata and P. tremuloides, with particular reference to oxygen consumption, M. E. FAUST (*Bot. Gaz., 97 (1936), No. 4, pp. 808–821, fig. 1*).—Herein are presented the results of storage, germination, and respiration studies with seeds of two species of poplar collected near Syracuse, N. Y. Among the findings were that in any single species large seeds germinate more readily and retain their viability longer than do small seeds, that a pH of from 7 to 8.5 gives the highest germination, that a

constant storage temperature approximating 5° C. favors long viability, that the largest percentage of germination occurs at 29° and 32°, that oxygen consumption is high when seeds are viable and contain much water, and that seeds of both species contain fats and proteins.

Methods and significance of pollen analysis [trans. title], H. GAMMA (*Schweiz. Ztschr. Forstw., 87 (1936), No. 6, pp. 180–186, figs. 2*).—With the aid of diagrams and descriptive matter the distinguishing characteristics of the fossil pollens of different forest species are pointed out. Of the various pollens found in peat those of *Abies, Pinus, Picea, Betula, Corylus, Alnus, Fagus, Carpinus, Quercus, Ulmus, Tilia,* and *Salix* are said to be most commonly found. The usefulness of pollen determinations for following the migration of trees since the ice age and in showing the composition of the prehistoric forests is indicated.

Variations in naval-stores yields associated with weather and specific days between chippings, V. L. HARPER and L. WYMAN (*U. S. Dept. Agr., Tech. Bul. 510 (1936), pp. 35, figs. 16*).—A study of gum yield records taken by the Southern Forest Experiment Station in forests of northern Florida from 1926–32, inclusive, and correlated with existing weather data showed that average air temperature, soil temperature, and evaporation have a large influence on gum flow in the first 24 hr. after chipping, accounting for approximately 90 percent of the variation in yield. Air temperature was by far the most influential factor of the three. There was no indication that rain had any definite effect on the yield of gum. With both species, longleaf and slash pines, the net effect of weather conditions on gum yield increased with the increasing interval following chipping. The two species had different capacities for sustained flow of gum; for example, with an air temperature averaging about 82° F. longleaf pines yielded 90 percent of their weekly total during the first 48 hr., whereas slash pines required about 96 hr. to reach the same percentage. At 52° both pines required 6 days to yield 90 percent of their weekly total. The rate of gum flow for slash pines was observed to reach a daily maximum at 9 a. m., the rapidity in rise of rate being directly associated with the rate of air temperature rise. Yield increases during the day were associated to a slight degree only with stem contractions, but in the few cases in which the stem expanded there was a marked decline in yield. As weekly chipping was continued there was a downward trend in production amounting to approximately 20 percent over a year. The optimum chipping interval was in general longer for the slash than for the longleaf pine.

Logging—transportation, N. C. BROWN (*New York: John Wiley & Sons; London: Chapman & Hall, 1936, pp. XV+327, figs. 167*).—This is a treatise on the principles and practice of log transportation in the United States and Canada.

DISEASES OF PLANTS

The Plant Disease Reporter, June 1, June 15, and July 1, 1936 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 20 (1936), Nos. 10, pp. 154–175, figs. 2; 11, pp. 176–186, figs. 2; 12, pp. 187–199*).—Among other items of current interest, these issues contain notes on the following:

No. 10.—A list of plants attacked by the leaf nematode (*Aphelenchoides fragariae*) (including 179 hosts, and 5 in the literature omitted because of probable errors), by L. Crossman and J. R. Christie; the relation of ear rot prevalence in Illinois cornfields to ear coverage by husks, by G. H. Boewe; reports on tobacco seedbed diseases in Maryland and Florida, by E. A. Walker and R. R. Kincaid, respectively; first blister rust (*Cronartium ribicola*) found

on sugar pine (*Pinus lambertiana*), by J. L. Bedwell; occurrence of rusts on cedars in Maine (including *Gymnosporangium juniperi-virginianae*, *G. globosum*, and *G. nidus-avis* on *Juniperus virginiana*, *G. clavipes* and *G. clavariaeforme* on *J. communis depressa*, *G. juvenescens* on *J. horizontalis*, and *G. ellisii* and *G. biseptatum* on *Chamaecyparis thyoides*), by *F. H. Steinmetz;* and *Volutella pachysandrae* blight on *Pachysandra* in New Jersey, by G. Westcott.

No. 11.—A destructive disease of the mimosa tree (*Albizzia julibrissin*) in the Carolinas (from which a *Fusarium* of the *oxysporum* group of the section *Elegans* was regularly isolated), by G. H. Hepting; sugarcane diseases in Puerto Rico, by J. H. Jensen; reports on apple scab (chiefly phenological data) in Massachusetts (by O. C. Boyd), in New York (by J. G. Goodrich), and in Wisconsin (by R. E. Vaughan); reports of blight on apple (chiefly phenological data) in Massachusetts (by O. C. Boyd), in New York, and in Wisconsin (by R. E. Vaughan); rust on apple in Massachusetts (by O. C. Boyd) and New York (by various observers) (chiefly phenological data); and severe damage to strawberries in Massachusetts from winter injury and dwarf (*Aphelenchoides fragariae*), by O. C. Boyd.

No. 12.—Downy mildew (*Peronospora tabacina*) of tobacco appears in Kentucky, and observations on diseases in tobacco beds in western Kentucky, both by E. M. Johnson; tobacco seedbed survey in Wisconsin, 1936 (chiefly on diseases), by J. Johnson; diseases of cabbage and beans in Copiah County, Miss., by P. R. Miller; low temperature injury of apple blossoms and scarcity of blight (*Bacillus amylovorus* [=*Erwinia amylovora*]) in Arkansas in 1936, by H. R. Rosen; crown rot (*Sclerotium delphinii*) of ornamentals in New Jersey, by C. Westcott; a mosaic disease of peach in Kentucky, by W. D. Valleau; and mottling or breaking in dames rocket (*Hesperis matronalis*) in Oregon, by F. P. McWhorter.

[Phytopathological studies by the Florida Station] (*Florida Sta. Rpt. 1935, pp. 42, 45, 62, 64, 65, 85–94 96–98 99, 100, 117, 118, 123–126, 129, 130, 132, 134, figs. 4*).—Progress reports are given of studies on field corn (analyses for nitrogen fractions) with "white bud", and corn not so affected due to applications of zinc, by W. A. Leukel and J. P. Camp; "chlorosis" in corn and other field crop plants and the effects of zinc sulfate applications, by R. M. Barnette and Camp; chlorosis in corn and other field crop plants and its control by various treatments, by Barnette; bronzing or copper leaf of citrus and the effects of lime treatments, by C. E. Bell and R. W. Ruprecht; starving out root knot nematodes by the use of *Crotalaria spectabilis*, by J. R. Watson; treatments for new outbreaks of citrus gummosis and the relations of various fungi to the malady; downy mildew of cucurbits, by G. F. Weber; certain diseases of strawberries of importance in Florida (including the relation of soil reaction to crop failure or poor condition, and "black root" in relation to soil reaction and various micro-organisms), by A. N. Brooks and R. E. Nolen; disease control in potatoes (including *Sclerotinia sclerotiorum* rot, seed-piece decay due to *Fusarium oxysporum* or a closely related form, and *Rhizoctonia* infection), and investigation and control of brown rot of potatoes and closely related plants caused by *Bacterium solanacearum* [=*Phytomonas solanacearum*] by inoculated sulfur and lime treatments, both by A. H. Eddins; investigation and control of a disease of corn caused by *Physoderma zeae-maydis*, and ear rot diseases of corn caused by *Diplodia* spp., with collections from over 21 other hosts, both by R. K. Voorhees; investigation and control of *F. nivcum* wilt and other fungus diseases of watermelons, by M. N. Walker; the so-called rust of *Asparagus plumosus*, by W. B. Shippy; control of *F. lycopersici* wilt of tomatoes (including breeding and selection of resistant varieties), by Weber and D. G. A.

Kelbert; *Clitocybe tabescens* mushroom root rot of citrus and other woody plants, by A. S. Rhoads; control of black spot (*Phoma destructiva*) of tomatoes in Florida and in transit, by W. B. Tisdale and S. Hawkins; *Colletotrichum fragariae* wilt or crown rot of strawberries, by Brooks; decays of citrus fruits in storage, including comparisons of various fungicides, by Tisdale and E. West; the spraying requirements necessary to control grape diseases in Florida, by K. W. Loucks; a bark disease of Tahiti lime trees, including isolations (*Phomopsis* in the majority of cases from cold-injured young trees), by Tisdale; *Sclerotium rolfsii* in Florida.—Its host relations and factors influencing its pathogenicity (including three new hosts), by West; rose diseases in Florida and their control (including control of black spot, the relation of sunlight to growth and deadwood, and nematode root knot), by Shippy; fruit rots (black rot and bitter rot) of grapes, by Loucks; melanose of citrus and its control, by G. D. Ruehle and W. A. Kuntz; die-back of citrus, including analyses of leaves, stems, and fruits of normal and abnormal trees with and without copper sulfate treatments, by B. R. Fudge; citrus scab and its control, by Ruehle; stem-end rot of citrus caused by *P. citri*, by Kuntz; sugarcane diseases (eyespot, red stalk rot, and mosaic), by B. A. Bourne; potato seed-piece decay, bacterial blights of green beans (*Phytomonas* spp.), root knot of beans and the relation of nematodes (*Heterodera marioni* and *Acrobeles complexus*), blight of lima beans, damping-off of vegetable seedlings, early blight of celery, spraying and dusting of Bountiful beans, spraying of lima beans, potatoes, and tomatoes, amaryllis mosaic, zinc deficiency disease of beans, and U. S. D. A. potato seedling tests, by G. R. Townsend; and field and laboratory studies of tobacco diseases (downy mildew, mosaic, and blackshank, including the development of strains of cigar-wrapper tobacco resistant to the last), by L. O. Gratz and R. R. Kincaid.

[Phytopathological studies by the Idaho Station] (*Idaho Sta. Bul. 220 (1936), pp. 7, 8, 39–43, figs. 3*).—Progress reports are given on observations and studies on the amelioration of chlorosis of apple trees by injection of iron salts alone or with zinc sulfate; the development of beans resistant to mosaic, curly top, and root rot; the incidence of and losses by curly top in vegetables and flowering ornamentals; fungus root rots of peas; mosaic of peas, red clover, and alsike clover; potato virus diseases; potato seed treatment for *Rhizoctonia*; seed treatment for diseases of cereals, including wheat bunt; losses by and development of varieties resistant to alfalfa wilt; alfalfa "black stem" disease (*Phoma medicaginis*, with *Pleospora rehmiana* as perfect stage); and a survey of the southeastern part of the State for wheat smuts, and studies of stripe rust of barley in cooperation with the U. S. D. A. Bureau of Plant Industry.

Insects in relation to plant diseases, J. G. Leach (*Bot. Rev., 1 (1935), No. 11, pp. 448–466*).—This critical review from the Minnesota Experiment Station discusses the varied relationships of insects and plant diseases, insects in relation to virus and to nonparasitic diseases, the biologic and evolutionary significance of the association of insects and plant pathogens, symbiosis between insects and micro-organisms and its significance in plant pathology, the possible role of insects in the origin of new plant diseases and in the extension of old ones, and the future development of research in the field of insects in relation to plant diseases. The literature list includes 79 entries.

The problems of plant disease control (*Montana Sta. Rpt. 1934, pp. 40–42*).—This is a general statement of the purposes and accomplishments of the department of botany and bacteriology in investigations of poisonous plants and plant diseases and their control and in the identification and control of weeds. Wheat diseases, including barberry eradication, and virus diseases of

potatoes, tomatoes, sugar beets, and beans are briefly discussed, and reference is made to progress with the herbarium, which includes 12,000 specimens of fungi.

[Phytopathological studies by the New Jersey Stations] (*New Jersey Stas. Rpt. 1935, pp. 57, 62–71*).—Progress reports are given of studies relative to control of chrysanthemum wilt; potatoes, including tests of sprays for the control of diseases and insect pests; the effects of fertilizer materials and methods of application on yields and on the development of scab (including fertilizer placement studies in cooperation with the U. S. D. A. Bureau of Plant Industry, acid v. neutral fertilizer mixtures, magnesium and potash, and calomel applications with the fertilizer); the development of brown stem or *Rhizoctonia* of potatoes as influenced by soil moisture and by seed disinfection with mercuric chloride; soil applications of mercury compounds in the control of sweetpotato scurf; soil applications of lime and of calcium cyanamide in the control of clubroot of crucifers; the development and testing of sweet corn strains and varieties resistant to bacterial wilt; bacterial canker of tomatoes; tomato seed treatment with copper dusts; spraying for the control of cantaloup diseases and insect pests; the effects of fungicidal treatments on rhubarb roots; the control of lettuce drop (*Sclerotinia minor*); damping-off control with formaldehyde dusts; control of pea root rot (*Aphanomyces euteiches*) by fertilizers; the influence of soil type on the time of maturity of the apple scab fungus, and tests of various copper and sulfur sprays in scab control; ascopore discharge studies on *Mycosphaerella rubina* causing raspberry spur blight; the mechanism of copper injury to apple, peach, and grape leaves; control of *Verticillium* wilt of eggplants by calcium cyanamide and by production of resistant hybrids; *Verticillium* wilt in the Pink Seidewitz chrysanthemum and its control; the Dutch elm disease eradication work; control of black spot and brown canker of roses; fertilization in the control of maple wilt (*V. dahliae*); rhododendron wilt (*Phytophthora cinnamomi*); *Phomopsis* sp., *Valsa* sp., and *Pityogenes hopkinsii* as secondary invaders in cankers of *Pinus excelsa* induced by winter injury; mulberry (*Morus*) canker due to *Fusarium* sp., and its control; smilax leaf spot and canker due to *Fusarium* sp.; *Taxus* die-back due to *Phomopsis* sp.; root and stem rot of *Pinus resinosa*, its etiology and control; and blueberry (*Vaccinium*) diseases due to *Gloeosporium* and *Phomopsis*. Plant disease survey data are included.

Control of soil fungi by soil fumigation with chloropicrin, G. H. Godfrey (*Phytopathology, 26 (1936), No. 3, pp. 246–256, fig. 1*).—Laboratory experiments designed to determine the practical fungicidal value of chloropicrin used as a soil fumigant were conducted by the University of California, using 4-gal. glazed stone jars of soil. The fungi tested were *Fusarium* sp. from gladiolus, *Phytophthora cactorum* from snapdragons, *Rhizoctonia solani* from sugar beet, *Verticillium alboatrum* from strawberry, *Sclerotium rolfsii* from sugar beet, *Dematophora* sp. from apple roots, and *Armillaria mellea* from prune roots. The cultures were inserted 6 in. deep next to the wall of the jar, and chloropicrin was introduced into the center at the rate of 1.25 cc per jar (equivalent to 400 lb. per acre-foot). The jar was then sealed with gas-impervious, glue-coated paper and left for 48 hr.

Culture tests on nutrient agar were negative for all fumigated jars, while all controls were positive. Subsequent small-scale tests with greenhouse soils spontaneously infested with plant-disease fungi and a greenhouse ground-bed test with tomato *Verticillium* gave corroborative evidence. The practicability of disinfecting greenhouse potting soils in special boxes and of sterilizing laboratory glassware by chloropicrin fumigation is believed to have been demonstrated.

Seedling culture in sand to prevent damping off, A. A. DUNLAP (*Phytopathology, 26 (1936), No. 3, pp. 278–284, fig. 1*).—In studies by the Connecticut [New Haven] Experiment Station, a large variety of seedlings were grown in washed sand with nutrient salts added in solution at time of planting. Similar cultures with treated and nontreated soils were grown under the same conditions for comparison. The best damping-off control was obtained by the sand-culture method. Seedlings grown in sand compared favorably with those from soil and were more readily transplanted. Other desirable features in favor of sand culture were noted.—(*Courtesy Biol. Abs.*)

Diagnosis of plant troubles with diphenylamine, L. H. JONES (*Plant Physiol., 11 (1936), No. 1, pp. 207–209*).—In this study by the Massachusetts Experiment Station, the plant part chosen for nitrate tests with diphenylamine depended on the plant. Negative tests may be obtained if the region taken is actively utilizing nitrates. Misuse of fertilizers carrying nitrate may be determined by using the diphenylamine test on the injured tissue. There was some indication that the ammonium ion from $(NH_4)_2SO_4$ may be transformed to the less injurious nitrate ion.—(*Courtesy Biol. Abs.*)

The peptidase system of Aspergillus parasiticus, M. J. JOHNSON and W. H. PETERSON (*Jour. Biol. Chem., 112 (1935), No. 1, pp. 25–34, fig. 1*).—This is a contribution by the University of Wisconsin.

Persistence of Erwinia amylovora in certain insects, P. A. ARK and H. E. THOMAS (*Phytopathology, 26 (1936), No. 4, pp. 375–381*).—In these studies by the University of California, larvae of *Drosophila melanogaster* and *Musca domestica*, after feeding on a medium contaminated by *E. amylovora* [=*Bacillus amylovorus*], carried the organism in their internal organs through the pupal and to the adult stages. Eggs of *M. domestica* from contaminated females carried the organism only externally. Adults of *D. melanogaster, M. domestica*, and *Lucilia seriata* harbored it internally and excreted it in viable condition in the feces for 6, 3, and 4 days, respectively. The organism remained viable in the viscera of honeybees for 48 hr., but was not recovered from the feces at any time nor from the heads later than 12 hr. after the time of contamination.

Lepiota morgani in southern California, C. O. SMITH (*Mycologia, 28 (1936), No. 1, p. 86*).—This note is a contribution by the California Experiment Station.

A method for inoculating wheat and barley with loose smuts, M. B MOORE (*Phytopathology, 26 (1936), No. 4, pp. 397–400, fig. 1*).—In this method, developed by the Minnesota Experiment Station, inoculation is accomplished with an apparatus in which an entire head of wheat or barley is subjected to an alternating partial vacuum while submerged in an aqueous suspension of chlamydospores. The alternating vacuum displaces the air in the florets with inoculum. From 90 to 100 percent infection was obtained in wheat and from 2 to 76 percent in barley.

Further experiments on the control of barley smuts, R. W. LEUKEL (*U. S. Dept. Agr., Tech. Bul. 513 (1936), pp. 12*).—Continuing this series of studies (E. S. R., 64, p. 145; 67, p. 138), it was noted that in two consecutive years barley from fields badly infected with covered smut (*Ustilago hordei*) produced crops with very low percentages of smutted heads.

Inoculation by the evacuation method or by applying dry spores to the seed with subsequent incubation at from 25° to 28° C. under high humidity resulted in about two to three times as much covered smut as by application of spores by natural agencies only. Inoculation by the first method produced a higher percentage of covered smut than by the second method, and the disease was less easily controlled.

Ceresan and New Improved Ceresan completely controlled covered smut and black loose smut (*U. nigra*). Soaking the seed in a 1:320 formaldehyde solution for 1 hr. eliminated black loose smut and gave a fair but not complete control of covered smut. Formaldehyde dusts were not consistently effective, though some brands gave better control than others. None of the commercial dust fungicides used were injurious to the seed, even with storage for 5 mo. after treatment.

The effect of corn smut on the yield of grain in the San Joaquin Valley of California, F. L. SMITH (*Jour. Amer. Soc. Agron., 28 (1936), No. 4, pp. 257–265*).—In this study by the University of California, the "grain from 220 pairs of smutted and adjacent nonsmutted plants was weighed. Analyses of differences were made by Student's method. Losses from smut infection on the ear and below the ear were calculated for small, medium, and large galls. Losses due to multiple galls of a number of different combinations were calculated. Losses due to smut below the ear are estimated to be 7 percent for small, 19 percent for medium, and 47 percent for large galls. Ear infections gave greater losses, 23 percent for small, 41 percent, for medium, and 82 percent for large galls.

"The percentage of barren stalks increased with the amount of smut. In stalks with large galls on the ear, 52 percent were barren, while 35 percent were barren when large galls occurred below the ear. Single small galls produced no barren stalks, neither did medium galls below the ear, but medium galls on the ear caused 4 percent barrenness. Multiple small and medium galls caused an increase in the percentage of barren stalks. Two or more large galls produced 100 percent barren stalks.

"The estimated loss in yield in the field having 17.4 percent smutted plants was 6 percent."

Effect of crown rust on the composition of oats, H. C. MURPHY (*Phytopathology, 26 (1936), No. 3, pp. 220–234, figs. 2*).—This reports a study by the Iowa Experiment Station in cooperation with the U. S. D. A. Bureau of Plant Industry relative to the effect of crown rust (*Puccinia coronata avenae*) infection on the yield and chemical composition of mature grain and green plants of susceptible and resistant oat varieties under greenhouse conditions.

Infection initiated in the anthesis stage on Markton (susceptible) and in the seedling, boot, and anthesis stages on Victoria (resistant) had no appreciable effect on the moisture, ash, fat, and fiber content of the kernels. There was a slight increase in protein and a corresponding decrease in nitrogen-free extract of the kernels of both varieties in relation to duration of infection. The composition of the oat hulls was not appreciably affected by the infection. The green weight of the susceptible varieties Markton and Iogold was reduced by 69.3 and 63.6 percent, respectively, as a result of infection, while the corresponding reductions for the resistant varieties Victoria and Bond were 22.2 and 14.7 percent, respectively. Concentrations of insoluble solids, ash, nitrogen, and acid-hydrolyzable substances in the green plant were all increased by the infection. Ammonia, amide, and nitrate and nitrite nitrogen showed the greatest percentage of increase. The increases in these noncolloidal nitrogen fractions for the susceptible Markton variety were 257.1, 327.3, and 322.0 percent, respectively, while the greatest increase for the colloidal or protein nitrogen was 25.8 percent. Corresponding maximum increases for insoluble solids and acid-hydrolyzable substances were 29.6 and 29.7 percent, respectively. The proportions of total soluble solids, sugars, and dextrin in the green plant were all decreased by the infection. The sugars showed the greatest decreases, sucrose, glucose, and levulose being

decreased by 83 6, 78.7, and 97.4 percent, respectively, in the infected Markton plants, while total soluble solids and dextrin showed a corresponding decrease of 19.3 and 23.3 percent, respectively.

A new Pseudodiscosia, R. SPRAGUE and A. G. JOHNSON (*Mycologia, 28 (1936), No. 2, pp. 181–185, figs. 2*).—In this paper, reporting a cooperative investigation by the Oregon and Washington Experiment Stations with the U. S. D. A. Bureau of Plant Industry, *P. avenae* n. sp. is described from a leaf spot of fall-sown oats (*Avena sativa*) occurring in the States of Oregon and Washington.

Can different degrees of bunt resistance be recognized in F_2 plants? A. M. SCHLEHUBER (*Jour. Amer. Soc. Agron., 28 (1936), No. 4, pp. 266–270, fig. 1*).—The results of this study by the Washington Experiment Station in cooperation with the U. S. D. A. Bureau of Plant Industry are believed to show definitely that different degrees of bunt resistance can be recognized in F_2 plants. The data are evaluated from the standpoint of practical application to breeding for bunt resistance.

Reaction of certain varieties and species of the genus Hordeum to leaf rust of wheat, Puccinia triticina, C. O. JOHNSTON (*Phytopathology, 26 (1936), No. 3, pp. 235–245, fig. 1*).—Greenhouse experiments by the Kansas Experiment Station in cooperation with the U. S. D. A. Bureau of Plant Industry, using seedlings, proved that varieties of cultivated barley and wild species of *Hordeum* differ in their responses to leaf rust of wheat. No variety or species was fully susceptible, but some permitted sporulation of the fungus. Among the cultivated barleys, varieties of the botanical group *H. intermedium cornutum* approached susceptibility. Of the 8 species of wild barley tested, *H. spontaneum, H. maritimum, H. bulbosum, H. gussoneanum,* and a strain of *H. murinum* bore reproductive infections. Several physiologic forms of the fungus were used, but differences in the reaction of the various varieties and species to them were only slight in most cases.

The greatest number of varieties and species bearing pustules occurred in the 14- and 28-somatic chromosome groups. *H. nodosum* (42 chromosomes) was highly resistant. This is the reverse of the condition in *Triticum*.

Bacteriophage as related to the root nodule bacteria of alfalfa, S. C. VANDECAVEYE and H. KATZNELSON (*Jour. Bact., 31 (1936), No. 5, pp. 465–477, figs. 2*).—In this study by the Washington Experiment Station, a potent lytic principle active against four out of five laboratory cultures of *Rhizobium meliloti* was isolated from each of two soils from the Yakima district carrying 3-year-old alfalfa stands. Further study of soil and plant samples from 20 alfalfa fields failed to reveal bacteriophage from soils carrying plants less than 3 yr. old. The most common source of the bacteriophage was the soil from fields growing alfalfa off and on for many years and carrying 3- and 4-year-old stands. Indications of the presence of the lytic principle were found in the nodules regardless of the age of the plants. In general, nodulation was poor on plants in fields carrying the bacteriophage.

One of the isolations caused complete dissolution of a 24-hr. fluid culture of *R. meliloti* at a dilution of $1:10^9$ and partial clearing at $1:10^{11}$. The transmissibility of the isolation from one of the soils was demonstrated in fluid cultures and by means of plaques.

It is deemed possible that bacteriophage may be responsible for reduced yields, but definite conclusions are reserved pending further investigation.

Discussion of disease-free and disease-resistant beans, J. C. WALKER (*Canning Age, 17 (1936), No. 4, pp. 171, 172, 178*).—This is a contribution by the Wisconsin Experiment Station.

The diurnal cycle of the powdery mildew, Erysiphe polygoni, C. E. YARWOOD (*Jour. Agr. Res.* [*U. S.*], *52* (*1936*), *No. 9, pp. 645–657, fig. 1*).—In this cooperative study between the U. S. D. A. Bureau of Plant Industry and the University of Wisconsin, conidia of clover mildew (*E. polygoni*) placed on dry glass slides in the dark germinated best when removed from diseased field or greenhouse plants during the light portion of the day and germinated poorly when removed at night. The germination of conidia taken at night was greatly increased when they were exposed to light or placed on host leaves. In each conidiophore one conidium was matured about noon, and the generative cell divided in the late afternoon. In the field, dissemination of conidia occurred most actively during the light portion of the day. The mycelium grew at a fairly uniform rate throughout the day and night, but appressoria were formed principally in the light. Inoculations were more successful during the light portion of the day than at night. Mildewed leaves transpired more actively than healthy leaves at night, but equal to or less than normal leaves during the day. Tests of these cyclic phenomena in chambers where light was the only environmental factor known to vary throughout the day indicate that alternation of light and darkness is responsible for this diurnal periodicity. A similar diurnal cycle was indicated for forms of *E. polygoni* on red clover, delphinium, and cabbage, but none was established for *E. graminis* on barley.

Host range and physiologic specialization of red clover powdery mildew, Erysiphe polygoni, C. E. YARWOOD (*Jour. Agr. Res.* [*U. S.*], *52* (*1936*), *No. 9, pp. 659–665, fig. 1*).—In this joint study from the U. S. D. A. Bureau of Plant Industry and the Indiana Experiment Station, the susceptibility of 20 *Trifolium* spp. to *E. Polygoni* was determined by tests in the field, greenhouse, and laboratory, 14 proving susceptible in varying degree. Of these, *T. lupinaster*, *T. carolinianum*, *T. striatum*, *T. reflexum*, *T. angustifolium*, *T. panormitanum*, *T. squarrosum*, *T. resupinatum*, *T. subterraneum*, and *T. repens* are believed to be new records of hosts susceptible to this fungus.

From several collections secured from various parts of the United States and from Canada, three physiologic forms were distinguished. It appears from these limited tests that form 1 is widely prevalent, and that forms 2 and 3 are relatively rare. Moreover, since these three forms are similar, they are probably all of the epidemic type which spread so rapidly from the East to the West of the United States from 1921 to 1924. Since powdery mildew of clover was present in the United States previous to 1921, this earlier mildew probably differed from those here studied.

The tests of host susceptibility and of physiologic forms were greatly facilitated by a method of growing the fungus on living, excised leaves floating on sucrose solution.

A study of Stewart's disease of sweet corn caused by Phytomonas stewarti[i], C. W. FRUTCHEY (*Michigan Sta. Tech. Bul. 152* (*1936*), *pp. 25, figs. 5*).—This monograph gives a rather full review of the work of previous investigators of this disease. Its great economic importance is stressed, and the symptoms are described in detail. The author was never able to isolate the causal organism from the soil or from the embryo of the seed, but he obtained it repeatedly from the extraembryonic parts of seed from diseased plants. Fully controlled experiments appeared to indicate conclusively that the organism within the vascular tissue at the kernel base is unable to invade the embryo at the time of germination unless some injury has occurred that would afford an avenue of entrance.

Conclusive experimental proof is presented, including repeated isolations of *P. stewartii*, both externally and internally, from larvae of the seed-corn

maggot (*Hylemyia cilicrura*), that this maggot can and does carry the organism from the infected to the uninfected part of the seed. The fact that the maggot attacks corn plants and also carries the organism internally in a virulent form is conclusive evidence of its role in the dissemination of Stewart's disease. Proof is also given that the common wheat wireworm (*Agriotes mancus*) may act as a mechanical carrier of inoculum, though the organism was never isolated from its internal parts. Wireworms are considered of minor importance in the field because of their low incidence (except in soddy soil), and of their apparent inability to harbor the bacterium for any length of time. From the above evidence, together with that presented by Rand and Cash (E. S. R., 69, p. 663) and by Poos and Elliott (E. S. R., 73, p. 325) with reference to dissemination by flea beetles, it is concluded that insects play an important role in the spread of the disease.

A *Fusarium* and a white bacterium (unnamed, but possibly related to *P. dissolvens*) were sometimes found associated with *P. stewartii*. The fungus causes a foot rot, but is not believed to be an important factor in Stewart's disease because it is so virulently parasitic as to overshadow the effects of *P. stewartii*. Experiments indicated that the white bacterium may be very important in the spread of (and in causing wilt symptoms resembling) Stewart's disease, since it can attack and rot away the tissues, thus allowing *P. stewartii* to gain an entrance into the vascular system of the seed.

Other than by the use of resistant varieties, there are no known methods for control. As shown also by various other workers, surface sterilization of infected seed proved ineffective, and no successful method of sterilizing the interior of the seed without embryo injury was found by the author.

As general results of the investigation, it is concluded that infected seed, insect transmission, and organisms associated with *P. stewartii* are the main factors influencing the development of Stewart's disease. Though *P. stewartii* can be isolated from seed developed on affected plants, few or no wilted plants develop from this infected seed in the absence of other factors, due to the fact that the organism is not found in the embryo and is unable to penetrate unaided from the chalazal region into the vascular tissue of the young seedling. Insects feeding on the roots and old kernels of the seedling may spread the disease by themselves carrying the organism or by contact spread in the case of infected seed. Morphological and other data lead the author to believe that general infection of a corn plant with *P. stewartii* occurs at the base of the plant, where large numbers of vascular bundles are involved, whether the inoculum is in the seed or is carried by insect larvae.

Longevity of sclerotia of Phymatotrichum omnivorum in moist soil in the laboratory, J. J. TAUBENHAUS and W. N. EZEKIEL (*Amer. Jour. Bot., 23 (1936), No. 1, pp. 10–12, fig. 1*).—Tested at yearly intervals by the Texas Experiment Station, sclerotia stored in the laboratory in soil of from 20 to 40 percent moisture content gave 12 percent germination after 5 yr., produced normal growth in media and soil, and caused typical root rot on cotton.

Insects as possible distributors of Phymatotrichum root rot, J. J. TAUBENHAUS and L. D. CHRISTENSON (*Mycologia, 28 (1936), No. 1, pp. 7–9*).—From this preliminary cooperative study by the Texas Experiment Station with the U. S. D. A. Bureau of Entomology it appears that insects are probably not involved in the spread of *P. omnivorum*.

Phymatotrichum root rot on winter and spring weeds of south central Texas, J. J. TAUBENHAUS (*Amer. Jour. Bot., 23 (1936), No. 3, pp. 167, 168*).—Studies made by the Texas Experiment Station clearly showed that *P. omnivorum* can survive on 14 different winter and spring weeds normally growing in

fallow fields and in fields devoted to permanent cotton or to corn. Such weeds may act as bridging hosts, enabling root rot to spread to succeeding cotton crops or to summer annual and perennial weeds which are nearly always present in corn or fallow fields.

Fertilize to control cotton wilt and rust, V. H. YOUNG (*Better Crops With Plant Food, 20 (1936), No. 7, pp. 13–16, 37–40, figs. 6*).—This contribution by the Arkansas Experiment Station summarizes experiments leading to the conclusion that cotton wilt and rust can be almost completely eliminated, provided root knot is absent, if a resistant variety is employed and enough potash is applied to control rust or potash hunger.

Potash for cotton wilt and rust in south Mississippi, L. E. MILES (*Better Crops With Plant Food, 20 (1936), No. 9, pp. 6–8, 41–44, figs. 3*).—As a result of the studies by the Mississippi Experiment Station here reported, a sound basis for control of cotton rust and wilt is attained. Rust can be controlled by the use of a fertilizer containing an adequate amount of potash, and measures increasing the humus content of the soil are also beneficial. A suitably adapted variety with at least moderate resistance is advised for wilt control, and an increased amount of potash is also an aid.

Seed-potato treatment for Rhizoctonia control in northeastern Maine, 1929 to 1933, W. P. RALEIGH and R. BONDE (*Phytopathology, 26 (1936), No. 4, pp. 321–343*).—In this cooperative study between the U. S. D. A. Bureau of Plant Industry and the Maine Experiment Station, various standard and new materials were tested for *Rhizoctonia* control. Seed-tuber treatment of infected Irish Cobblers usually increased the stand, heightened the average vigor of the plants, reduced the injury from stem lesions and the percentage of infected tubers, and increased the yield. Treatment of clean Irish Cobblers and field-run Green Mountains failed to increase the yield. The acidulated corrosive sublimate ($HgCl_2$ 1–500, with 1 percent HCl) 3-min. treatment was satisfactory for *Rhizoctonia* control, but it appeared somewhat more dangerous as to injury than the standard $HgCl_2$ treatment. A solution of $HgCl_2$ 1–1,200 with potassium iodide 1–400, used as a dip treatment, gave promising results. The organic mercury dips used were slightly inferior to the standard $HgCl_2$ treatment. Clean Irish Cobblers planted in a separate experiment, either treated or not, produced a crop bearing very few *Rhizoctonia* sclerotia.

A method for the isolation of Actinomycetes from scab lesions on potato tubers and beet roots, C. F. TAYLOR (*Phytopathology, 26 (1936), No. 4, pp. 387, 388*).—In this contribution by Cornell University the following procedure is given: A mixture of 3 parts of calcium hypochlorite (10 g shaken in 140 cc tap water and filtered) and 1 part of sodium hydroxide (250 g dissolved in water and made up to 1,000 cc) stock solutions is used as the disinfectant. Scabby tubers are held in this mixture for 2 min., removed, and without washing a section of a lesion is triturated in a few drops of sterile water. Plated in S. A. Waksman's egg albumin agar, the resultant suspension gives a relatively pure culture of *Actinomyces*.

Soil actinomyces and potato scab, B. F. LUTMAN, R. J. LIVINGSTON, and A. M. SCHMIDT (*Vermont Sta. Bul. 401 (1936), pp. 32, pls. 4, figs. 20*).—A rather full review of the published work on potato scab and discussions of the methods of soil counts and plating out of the micro-organisms are presented, including the differentiation of two groups of actinomyces as colorless and brown-producing, respectively, on media.

Susceptible potato varieties were grown during the period 1914–17 on two field plats to determine their resistance to potato corky scab, with the result that almost 100 percent of badly scabby tubers were produced in 1916 on one

of these soils (a sandy loam) and almost as much on the other (a heavy clay loam). The sandy loam was not in potatoes between 1916 and 1934, timothy, corn, soybeans, and oats being grown thereon. A portion of the clay plat was planted twice to potatoes during this period. Beginning in 1924, bacterial counts were made by the plating-out method (1–1,000,000 dilution) during 8 yr. The total numbers of organisms and of actinomyces and the soil moisture contents were determined monthly, counts being based on 1 g of dry soil.

The total numbers of organisms were highest during winter, when the soil moisture was also highest, the rise beginning in November and the high counts continuing until April. The lowest totals were from May to October, inclusive, when the soil moisture was also at a low ebb. The actinomyces counts roughly paralleled those of the total numbers of organisms. During the 8 yr. the numbers of actinomyces neither increased nor diminished, remaining relatively stable though varying somewhat from year to year. An equilibrium apparently existed between the numbers and relative proportions of the actinomyces and the other organisms. The actinomyces in the soil existed mainly in the form of bits of mycelium (spores being relatively few), and the numbers as determined on the slides and by plate counts were reasonably concordant. In both soils the bacteria occurred mostly in the vegetative state, and the spore numbers and percentages followed closely the total numbers of organisms month by month. The spores of the soil bacteria failed to color with any of the differential spore stains, although they were physiologically spores in their temperature resistance.

Disinfected Green Mountain potato seed was planted on the sandy loam soil after an absence of potatoes for 19 yr., and gave yields (1935) of 70.2 percent clean, 26.5 slightly scabby, and 3.3 percent badly scabby. The corresponding yields for the 1916 crop had been 0.0, 0.8, and 99.2 percent, respectively.

The loss from once infected soil of pathogenic species of actinomyces which will produce typical, deep scab might be explained as follows: (1) the pathogenic species or strains may have died out in the soil from lack of a suitable host. (2) Many species or strains may have pathogenic tendencies but, with no suitable host present, may lose them. They may regain these pathogenic habits if a suitable host is later provided. The first indications of the return of the disease is its reappearance in a milder form, which in the case of potato scab would be a russeting. The senior author is inclined to believe that the second hypothesis is more likely to represent the truth.

Disease resistance tests and seedling selections in 1935 at the U. S. Sugar Plant Field Station, Houma, La., E. V. Abbott, E. M. Summers, and R. D. Rands (*Sugar Bul., 14 (1936), No. 12, pp. 3–7*).—The authors report notable progress in the search for new sugarcane varieties possessing superior qualities of disease resistance, sugar yield, and economical handling, and a brief summary of the disease resistance tests and primary selection work is given.

Possible chemical nature of tobacco mosaic virus, C. G. Vinson (*Science, 79 (1934), No. 2059, pp. 548, 549*).—It is reported in this contribution by the Missouri Experiment Station that under the experimental conditions "purified virus preparations which seemed to contain the major portion of the original virus have not yet been obtained free of nitrogen."

A tobacco hybrid useful for virus studies, J. Johnson (*Amer. Jour. Bot., 23 (1936), No. 1, pp. 40–46, figs. 7*).—In this contribution by the Wisconsin Experiment Station in cooperation with the U. S. D. A. Bureau of Plant Industry, the behavior of ordinary tobacco mosaic virus was studied on the first generation of *Nicotiana tabacum* × *N. glutinosa*, an apparently sterile hybrid

morphologically resembling *N. tabacum*. In the latter parent the characteristic infection is systemic without primary necrotic lesions, while in *N. glutinosa* the opposite is true. The hybrid resembles the latter in its reaction to the virus, but infection may become systemic, so that it is then relatively simple to trace the path of the virus. All the tissues of the leaf and stem may be invaded, but the xylem appears least likely to be affected. The first signs of infection often appeared in the cambium or pericycle. The phloem thus seems to have no special relation to the virus movement. The most favorable temperature for virus multiplication was apparently around 22° to 24° C. Spraying the virus on the leaves of the hybrid gave but few local lesions, indicating the rarity of stomatal invasion.

Aphid transmission from tomato to the hybrid is shown by the necrotic lesions produced. In this way it was found that less than 1 percent of the three aphid species used transmitted the virus from tomatoes.

The hybrid is apparently less susceptible than *N. tabacum* to ordinary tobacco mosaic but possesses advantages over both parents for certain types of virus study. It was also found susceptible to several other viruses.

Inheritance of resistance to root rot in tobacco caused by Thielavia basicola, T. C. McIlvaine and R. J. Garber (*Jour. Amer. Soc. Agron., 28 (1936), No. 4, pp. 279–283, fig. 1*).—The results of this study by the West Virginia Experiment Station in cooperation with the U. S. D. A. Bureau of Plant Industry indicate resistance of tobacco to *T. basicola* to be heritable as a dominant or partially dominant characteristic.

Tobacco streak, a virus disease, J. Johnson (*Phytopathology, 26 (1936), No. 3, pp. 285–292, figs. 3*).—Tobacco streak, a relatively rare disease, shown by cooperative studies between the Wisconsin Experiment Station and the U. S. D. A. Bureau of Plant Industry to be due to a virus, is characterized by striking necrotic patterns on the leaves, which usually have a close relation to the veins. A marked tendency to recovery from symptoms is noted.

The virus is mechanically transmissible by plant extracts, but no insect vector has yet been demonstrated. Its survival time in vitro is less than 36 hr. at 22° C., its thermal death point 53°, and its tolerance to dilution less than 1 in 30. Several other solanaceous species are susceptible to the virus, while others (e. g., tomato) are apparenly immune.

Physalis subglabrata: A natural host of Bacterium angulatum, W. D. Valleau and E. M. Johnson (*Phytopathology, 26 (1936), No. 4, pp. 388–390*).—*P. subglabrata* plants collected from pastures and fence rows 2 mo. after tobacco had been harvested on the Kentucky Experiment Station farm were infected with *B. angulatum* [=*Phytomonas angulata*], and in one case a single colony isolation gave two strains of *B. tabacum* [=*P. tabaci*] differing in colony characters. The evidence seemed sufficient to prove that *Physalis subglabrata* is a natural host of *B. angulatum* and probably also of *B. tabacum*. This and perhaps other solanaceous weeds must be considered in future epiphytological studies of these diseases.

Resistance to Cladosporium fulvum, E. F. Guba (*Phytopathology, 26 (1936), No. 4, pp. 382–386*).—In this contribution by the Massachusetts Experiment Station, it is reported that the tomato varieties Maincrop, Norduke, Up-to-Date, Norton, and certain hybrids obtained from England have shown some degree of resistance to the fungus, but hybridization within these varieties has failed to yield lines sufficiently resistant to be considered of commercial value. The currant tomato (*Lycopersicum pimpinellifolium*), which is immune, has been hybridized with large-fruit tomato sorts, and the progress of the work indicates the probability that large-fruit tomatoes completely resistant to this leaf mold will be developed.

A review of the pertinent literature and a bibliography of 37 titles are included.

New wilt-resistant tomatoes for Illinois, W. A. HUELSEN (*Canning Trade, 58 (1936), No. 35, pp. 10–12*).—As a result of 10 yr. of breeding work by the Illinois Experiment Station, three new field varieties (Prairiana, Early Baltimore, and Illinois Pride) resistant to *Fusarium* wilt have been isolated and are here described. They are now being released to the public.

Florida has wilt resistant watermelon, J. THOMAS (*Fla. Grower, 45 (1936), No. 2, p. 7*).—This is a popular account of the Leesburg variety developed by the Florida Experiment Station.

Effect of magnesium deficiency on the growth of vegetables, R. L. CAROLUS (*Veg. Growers Assoc. Amer. Ann. Rpt., 1935, pp. 97–103*).—This general account of the magnesium deficiency disease is a contribution by the Virginia Truck Experiment Station, in which are included data on the effects of additions of magnesium on the growth, yield, and composition of various truck crops, the characteristic types of injury from magnesium deficiency in these crops, prevention of this deficiency by additions of magnesium-containing salts (including specific recommendations), and on the magnesium requirements of various truck plants (including the amounts lost in the harvested crops).

Seed-borne diseases of vegetables, O. C. BOYD (*Veg. Growers Assoc. Amer. Ann. Rpt., 1935, pp. 219–230*).—This contribution by the Massachusetts State College gives a general discussion of these diseases and their control.

The value of "insoluble" coppers in vegetable disease control, J. D. WILSON (*Ohio Veg. Growers' Assoc. Proc., 21 (1936), pp. 99–104*).—The results expressed in this contribution from the Ohio Experiment Station suggest that some of the insoluble copper compounds now available may be used advantageously on crops which are frequently injured or stunted by bordeaux mixture and in which disease control is not especially difficult. Basic copper chloride offers promise for tomatoes, and this or Coposil are recommended for cucumbers. "Either of these compounds could probably be used to advantage as substitutes for dry bordeaux when only a small amount of spray is to be prepared, as in the home garden."

Important considerations in control of diseases of greenhouse vegetables, E. F. GUBA (*Veg. Growers Assoc. Amer. Ann. Rpt., 1935, pp. 251–258*).—This contribution by the Massachusetts Experiment Station offers some of the important developments and recommendations relative to the control of greenhouse vegetable diseases. "A planned program of disease control must include proper rotation and supply of soil nutrients, manure, and the proper soil reaction considered best for the particular crop being grown."

Some problems and principles of orchard disease control, with special reference to sanitation and related measures, G. W. KEITT (*Jour. Econ. Ent., 29 (1936), No. 1, pp. 43–52*).—This contribution by the Wisconsin Experiment Station is one in a symposium on orchard sanitation, briefly discussing the more important phases of the subject and giving fuller data on apple scab control as an illustrative problem.

The honeybee and the beehive in relation to fire blight, E. M. HILDEBRAND and E. F. PHILLIPS (*Jour. Agr. Res. [U. S.], 52 (1936), No. 10, pp. 789–810, figs. 2*).—The results of these studies over four seasons by the [New York] Cornell Experiment Station indicate that *Erwinia amylovora* [=*Bacillus amylovorus*] is incapable of overwintering in the beehive or in association with the honeybee. When introduced in the food of the bees, the fire blight bacteria were not reisolated after 3 days from such locations as honey, comb, frame, and bees. In only two cases was recovery made after 3 days from the time

contaminated food was taken, viz, from pollen at 13 days and from frame scrapings at 12 days.

The bacteria survived for relatively short intervals (from 1 day to several weeks, depending on the kind of sugar and the temperature) at sugar concentrations of 30 percent or over, covering the range from heavy nectar to honey that would be found in the hive, and they ordinarily survived longest at the lower temperatures. Of the materials used, sucrose solution had the least bacteriostatic and bactericidal effect. With a synthetic culture solution as the base, the maximum sugar concentrations at which the organism grew in dextrose, levulose, artificial nectar, and sucrose, were, respectively, 30, 30, 35, and 58 percent. These data indicate that survival of *E. amylovora* in the hive is highly improbable at the temperatures and sugar concentrations normally encountered there.

The bacteria were not found associated with the immature stages in the honeybee life cycle, even though an abundance was present in the food of the bees at all times during the rearing of the brood. The honeybee was found to function in two ways, viz, (1) in carrying the bacteria from the hive to the flowers, and (2) in the dissemination of inoculum from flower to flower. Transfer of inoculum from hive to flowers was conditioned, however, on the bees actively feeding on contaminated food.

Persistence of Erwinia amylovora in certain insects, P. A. ARK and H. E. THOMAS (*Phytopathology, 26 (1936), No. 4, pp. 375–381*).—The results of an investigation of the biological transmission of the fire blight organism (*E. amylovora*) under laboratory conditions by the pomace fly, housefly, green-bottle fly *Lucilia sericata*, and honeybee are reported. Larvae of the pomace fly and the housefly after feeding on a medium contaminated by *E. amylovora* were shown to contain the organism in their internal organs. The bacteria persisted through the pupa to the adult in both of these insects. Eggs of the housefly from contaminated females carried the organism externally but not internally. Adults of the pomace fly, housefly, and green-bottle fly harbored the organism internally for 6, 3, and 4 days, respectively. The bacteria remained viable in the viscera of honeybees for 48 hr. but were not recovered from the heads after 12 hr. from the time of contamination.

A review of the apple disease situation, H. C. YOUNG (*Ohio State Hort. Soc. Proc., 69 (1936), pp. 16–18*).—This contribution from the Ohio Experiment Station gives a summary of apple disease conditions in the State for 1935, with special reference to scab, cedar rust, frogeye or black rot, and bitter rot, and including data on the results of spray treatments.

What fungicides should be used for apple diseases in 1936? H. W. ANDERSON (*Ill. State Hort. Soc. Trans., 69 (1935), pp. 441–456*).—In this contribution by the University of Illinois, the "Illinois spray schedule" is recommended, with minor changes under certain conditions. Spray materials for scab and for diseases other than scab and "the 1936 spray schedule" are briefly discussed.

Some environmental factors influencing the development of hairy root on apple, A. J. RIKER, D. H. PALMITER, and E. M. HILDEBRAND (*Jour. Agr. Res. [U. S.], 52 (1936), No. 9, pp. 715–721, figs. 4*).—In studies at the Wisconsin Experiment Station, "inoculations with *Phytomonas rhizogenes* [=*Bacterium rhizogenes*] were made on 1-year-old Fameuse apple trees kept at graduated soil temperatures and soil moistures. The highest incidence of infection, in the time of the experiment, appeared at 24° to 28° C., and at 60 and 75 percent of the moisture-holding capacity of the soil. This probably indicated the shortest incubation period. The growth of the shoots in length was greatest

at 20°, with vigorous growth between 16° and 28°. Their growth was also more vigorous at 75 and 90 percent soil moisture than at 60 percent. The development in weight of hairy root was greatest at 24° to 28°. It was good over the entire range and only slightly greater at 75 and 90 percent moisture than at 60 percent. The air temperature was approximately 24°.

"The growth of the hairy root bacteria was measured by colony diameter on yeast-infusion and carrot agar, and by turbidity in a yeast-infusion liquid medium, at temperatures from 4° to 36°. Vegetative growth was greatest at 28°, good at 16°, 20°, 24°, and 32°, moderate at 8° and 12°, and slight at 4° and 36°."

Apple scab, A. B. GROVES (*Va. Fruit, 24 (1936), No. 3, pp. 10, 12, 14, 16–18, fig. 1*).—This contribution from the Virginia Experiment Station describes the disease, gives the developmental cycle of the fungus, and discusses varietal differences in susceptibility and control measures.

The newer modified spray formulas in apple scab control, F. H. BALLOU and I. P. LEWIS (*Ohio State Hort. Soc. Proc., 69 (1936), pp. 43–54*).—This contribution from the Ohio Experiment Station gives a general discussion of the spray materials and formulas and other factors important for success in the control of scab. Special reference is made to the materials and formulas for use on varieties (1) susceptible to scab and not easily russeted, and (2) not susceptible to scab but easily russeted. Some of the more important apple varieties are listed with their classification as to susceptibility to scab and russeting, and suitable spray formulas for each class are given. Tabulation and discussion of the results of spray experiments under Ohio conditions are also included.

Apple scab spraying results at Lafayette in 1934 and 1935, C. L. BURKHOLDER (*Hoosier Hort., 18 (1936), No. 5, pp. 75–77*).—This contribution by the Indiana Experiment Station details the local conditions relative to scab in 1934 and 1935, including the results of the spray schedules used. These indicated that scab is easily controlled under conditions of light carry-over, but that, even so, at least one pre-bloom application is necessary.

"Observations on scab control in 1935", W. C. DUTTON (*Mich. State Hort. Soc. Ann. Rpt., 65 (1935), pp. 25–28*).—This contribution by the Michigan Experiment Station is an address setting forth the results of spray tests in two Michigan localities. Tests on Dutchess and Jonathan apples at South Haven indicated 1 gal. of liquid lime-sulfur, 4 lb. of dry lime-sulfur, or 4 lb. of flotation sulfur to 100 gal. of water to be the smallest amounts that could have been used without a serious falling off in control. At these concentrations, from 94 to 100 percent of the fruits were scab free on the susceptible Dutchess variety. Kolofog at 9 lb. per 100 gave 77 percent control, and at 6 lb. to 100 it gave 64 percent control.

In the experiment on Dutchess apples at Grand Rapids, 1 gal. of liquid lime-sulfur gave 97 percent control, 4 lb. of electric sulfur 94 percent, and 4 lb. of flotation sulfur 96 percent control. Unsprayed trees here had 92 percent of scabby fruit, and at South Haven 100 percent.

Dusting for the control of apple scab, H. H. WHETZEL (*Ill. State Hort. Soc. Trans., 69 (1935), pp. 217–223*).—This contribution from Cornell University is a semipopular address summarizing present knowledge concerning spraying v. dusting, including the author's own experience, in the control of apple scab.

A new imperfect fungus, A. G. PLAKIDAS and C. W. EDGERTON (*Mycologia, 28 (1936), No. 1, pp. 82–84, fig. 1*).—In this contribution from the Louisiana Experiment Station the authors describe *Dendrosporium* n. g. (Moniliaceae

Hyalodidymae), with *D. lobatum* n. sp. saprophytic on dead or dying bark of pear (*Pyrus serotina*).

Brown rot of stone fruits on the Pacific coast and its control, B. A. RUDOLPH (*Better Fruit, 30 (1936), No. 10, pp. 3–5, figs. 2*).—This contribution from the University of California Deciduous Fruit Station, San Jose, describes the types of brown rot producing, under Pacific coast conditions, blossom and spur blights, branch cankers, and fruit rot, and outlines control measures developed from experimental work. Sanitary measures for the destruction of hold-over stages are advised. For the control of blossom infection growers are advised to spray with bordeaux mixture when fruit buds first show the color of the petals, with sometimes a second spray shortly after the first blossoms open. For brown rot of the fruit, spraying or dusting with finely divided sulfur is recommended whenever the disease begins to appear. In any case a precautionary application is advised 3 or 4 weeks before harvest. Sulfur is not recommended for apricots because of the danger of injury.

The proper timing of sprays for fungus diseases of stone fruits, C. E OWENS (*Oreg. State Hort. Soc. Ann. Rpt., 27 (1935), pp. 102–105*).—This general paper by the Oregon Experiment Station emphasizes the importance of proper timing of spray applications.

Cherry leaf curl and root injury, L. R. LANGFORD (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 252, 253, fig. 1*).—In this preliminary report by the Wisconsin Experiment Station, a curling of the leaves suggestive of drought injury has been associated with a root condition thought to be due to winter injury.

Prune die-back, O. LILLELAND (*Better Crops With Plant Food, 20 (1936), No. 10, pp. 17–19, 37, 38, figs. 4*).—These studies by the California Experiment Station at Davis began after the observation of a sudden scorching of the leaves and dying back of the branches of well-grown Agen (French) prune trees in the Sacramento Valley in 1917, the first symptoms often appearing during the summer of the first heavy crop. Tests of the soils indicated a lack of, and a marked ability to absorb or fix, potassium. Fixation by the surface soil when potash fertilizers were broadcast prevented a remedying of the situation by this procedure, but the problem was solved by the development of a soil-injection method using ordinary pipe fittings and a spray outfit giving adequate pressure for the introduction of potash solutions around the trees to a depth of 3 ft. The ameliorating effect on die-back was very striking, but the productivity of the treated orchard was in no case maintained, indicating that factors other than the potash content of the soil must be considered. One of these factors was the marked tendency of trees in the die-back areas to set very heavy crops, and in the better orchards it was possible to prevent leaf scorching and die-back by removing the crop rather early or by severe pruning.

Peaches and almonds on these soils exhibited no definite signs of injury, but when grafted to prunes the symptoms of die-back became manifest. An affected 7-year-old prune tree removed to a better soil recovered, and independent tank experiments by Hoagland and Chandler (E. S. R., 70, p. 476) have confirmed the supposition that the disease is distinctly a nutritional (potash deficiency) trouble of prune trees. However, the failure to secure complete recovery in the field by the use of potassium salts is still a challenge. It is possible that the heavy cropping may result in a weakened root system deficient in carbohydrates and lacking the energy to extend and avail itself of the added potassium.

[The Columbian purple raspberry carries the virus causing mosaic in red and black raspberries] (*Farm Res. [New York State Sta.], 2 (1936), No. 4, p. 12*).—This is a brief note of a recent finding.

Chlorine in relation to ring-neck in avocado fruits, A. R. C. HAAS (*Calavo News, 1936, June–July, pp. 12, 13, fig. 1*).—This disease usually occurs on the fruit pedicel and consists of dry surface areas more or less separating from the living tissue and leaving a scar. Chemical analyses at the California Citrus Experiment Station indicated that the stem half of the pulp or skin contained more total chlorine than the tip half, and the inner part of the pulp more than the outer part. A relation was also shown between the chlorine content of the irrigation water, the condition of the trees, and the chlorine content of the pulp and skin of the fruits. Severe tipburn and defoliation also accompanied high chlorine conditions. Further analyses of ring neck and normal fruits indicated a much higher chlorine content in the former. There is thus some reason for assuming that possibly chlorine or other salts are factors associated with ring neck disease.

Blight: A non-parasitic disease of citrus trees, A. S. RHOADS (*Florida Sta. Bul. 296 (1936), pp. 64, figs. 20*).—Following discussions of the history of citrus blight, etiological theories, economic importance, distribution, and detailed description of the symptoms, the results of a 12-yr. study of the disease are presented.

Blight is a chronic wilt and decline, usually starting on one side of a tree and progressing over the entire top. It is essentially a disease of older groves. Although causing heavy losses in some localities, in general, it must be regarded as a comparatively unimportant trouble in Florida. Blighted trees obviously die back as a result of failure of the root system to support the tops rather than from any attack on the top itself. No organism that could be regarded as the cause has ever been found, and it has been clearly demonstrated that the disease is not transmitted in the budwood, apparently indicating that it is not due to a virus. Trees replacing blighted ones lived about as long as the original trees, and did not appear to be more subject to blight than those set on virgin land under similar conditions. The incidence of blight seems to be correlated definitely with soil and soil moisture conditions, including both deficits of moisture on the lighter soils and excesses on the lower, poorer drained ones, and combinations of these two extremes. It occurs most frequently on the lighter, droughtier types of high hammock soils closely underlain with rock. All available evidence appears to confirm the conclusions that blight is caused by extreme fluctuations of soil moisture, and extended observations have indicated that the physical structure of the soil, kind of rootstock, and grove management are contributing factors.

A less frequent but more or less identical chronic wilt and decline of citrus trees, likewise regarded as blight by growers, has been attributable to injury of the roots after prolonged saturation of the soil during unusual rises in the water table, and in some locations the trouble has been intensified by droughty periods following such rises, and the converse. Blight must therefore be regarded as a composite trouble.

Control must be effected by the application of preventive rather than remedial measures. Despite years of trial, no known method of treatment (including irrigation) has succeeded in effecting a permanent recovery. After the trouble develops, the only recourse is to remove the affected trees as soon as they cease to become profitable and to replant.

Citrus bronzing—a magnesium deficiency, O. C. BRYAN and E. F. DEBUSK (*Fla. Grower, 45 (1936), No. 2, pp. 6, 24, figs. 3*).—In soil amendment trials by the Florida Experiment Station, stimulative effects and alleviation of leaf discoloration in both citrus and crotalaria followed the use of magnesium lime as compared with regular lime or no treatment. Chemical analyses of the

leaves of both plants indicated a higher content of magnesium and calcium under the magnesium lime as compared to the other plats. Magnesium apparently affects the calcium assimilation.

It appears from these tests that the citrus "bronzing" and the crotalaria failures are in many cases due to a deficiency of available magnesium, and that from 300 to 500 lb. of magnesium lime per acre per year would alleviate both conditions.

Progress on the control of citrus chlorosis or decline, A. H. FINCH, D. W. ALBERT, and A. F. KINNISON (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 20–23, fig. 1*).—This paper gives the symptoms of a chlorosis of various plants, among which citrus is of greatest economic importance, described as "probably the most important physiological disease of citrus in Arizona." Progress reports are given on attempts to find a satisfactory means of applying the iron therapy and to determine a means of rendering the iron held in the plant available to the growing tissues. The disease differs from "mottle-leaf" in that young trees are rarely affected, the disease becoming more severe as the trees become older. The continued response of citrus trees in advanced stages to iron appears to indicate that the specific cause is in some way related to the iron metabolism.

Recommended practice for control of carnation blight and wilt, E. F. GUBA (*Florists' Rev., 77 (1936), No. 1995, pp. 13, 14*).—This is a contribution from the Massachusetts Experiment Station.

Control of chrysanthemum diseases described in detail, L. M. MASSEY (*Florists' Rev., 75 (1934), No. 1933, pp. 15–18, figs. 2*).—This contribution from the [New York] Cornell Experiment Station is a general summary of data on chrysanthemum diseases and their control, including *Fusarium* wilt and stem rot, *Verticillium* wilt (with varietal relations), nematode root knot and leaf injury, powdery mildew, *Septoria* leaf spot, rust (with varietal relations), yellows, and ray blights.

A Phomopsis canker and gall disease of gardenia, G. A. HUBER (*Florists Exch. and Hort. Trade World, 86 (1936), No. 10, p. 11*).—In this study by the Western Washington Experiment Station, considerable damage by this disease in greenhouses is reported. A fungus of the *Phomopsis* type was readily isolated, and the disease is believed to be the same as that occurring in California and Ohio (E. S. R., 71, pp. 213, 662). The symptoms are described, and control measures are recommended.

Diseases of bulbous iris foliage described for growers, F. P. MCWHORTER (*Florists' Rev., 78 (1936), No. 2014, pp. 23, 24, figs. 2*).—This contribution by the Oregon Experiment Station discusses the identification and control of four of the commoner foliage diseases (not including the rusts), viz, the small- and large-spored *Heterosporium* leaf spots, *Epicoccum* blight, and *Mystrosporium* or ink spot.

Disease among the lilies, G. L. SLATE (*Horticulture, 14 (1936), No. 5, pp. 96, 97*).—This contribution by the New York State Experiment Station gives the author's experiences with mosaic and *Botrytis* blight, including control measures and species and varietal differences in susceptibility. A brief note on *Fusarium* basal rot is also included.

Spraying—pruning—die-back, H. R. ROSEN (*Amer. Rose Ann., 1935, pp. 43–47*).—This contribution from the Arkansas Experiment Station reports a continuation of spray experiments for the control of black spot and powdery mildew of roses (E. S. R., 73, p. 66), together with seasonal data on these diseases. It is concluded that, considering previous results, until a nonstaining copper acetate is shown to be an effective rose fungicide at a noninjurious con

centration Palustrex sulfonate B remains the most promising fungicide for the control of these two diseases in the Middle West and South. Combined with the wetting agent Aresco its covering power is excellent, and it leaves no objectionable deposit unless lead arsenate has been added.

From observational data, the author ventures the opinion that "die-back is frequently due to the slow starvation of a shoot caused either by an excessive removal of the food-making organs, the leaves, or by some adverse root condition." When most of the leaves of a shoot are destroyed or removed by pruning, etc., during the first half of the growing season, the roots depending on that shoot for elaborated foods fail to receive their necessary nutrients and starvation phenomena follow.

The 1934 disease-control campaign, L. M. MASSEY (*Amer. Rose Ann., 1935, pp. 48–52*).—This note from the [New York] Cornell Experiment Station refers to the campaign among rose growers for the control of black spot and mildew of roses.

Injury from spray materials, L. M. MASSEY (*Amer. Rose Ann., 1935, pp. 38–40, pl. 1*).—This note from the [New York] Cornell Experiment Station refers to the unusual spray injury to the leaves of roses during the summer of 1934.

Red copper oxide spray for black-spot, R. O. MAGIE and J. G. HORSFALL (*Amer. Rose Mag., 1 (1936), No. 21, pp. 5, 6*).—This contribution from the New York State Experiment Station reports successful control of black spot of roses by a spray containing 1 part of red copper oxide to 1,600 parts of water, carefully applied every 2 weeks. The addition of a cottonseed oil emulsion at every third application of this spray is recommended to avoid foliage injury. The common insecticides are stated to be compatible with this copper spray.

Control of black spot on roses studied at Cornell, L. M. MASSEY and E. W. LYLE (*Florists' Rev., 77 (1936), No. 1997, pp. 19, 20, 76, 77*).—This is a semipopular account of studies at Cornell University showing that black spot can be controlled in greenhouses by ceasing to syringe the plants, using Selocide for red spider control, and observing good greenhouse practices.

Control of black-spot on greenhouse roses, E. W. LYLE and L. M. MASSEY (*Florists Exch. and Hort. Trade World, 86 (1936), No. 9, pp. 11, 15*).—This is a progress report of studies by Cornell University showing that this disease may be controlled in greenhouses by avoidance of syringing and use of "Selocide" (1 part to from 300 to 400 parts of water) for red spider control. Other advantages from the elimination of syringing are enumerated.

A study of the life history of Ceratostomella ulmi in relation to the development and spread of the Dutch elm disease, C. MAY (*Ohio State Univ., Abs. Doctors' Diss., No. 17 (1935), pp. 271–276*).—This summary of a study of the Dutch elm disease, found for the first time in the United States in Ohio by the author in 1930, is a contribution by the Ohio State University. The work comprised an investigation of some of the factors affecting the isolation, growth, spore production, and identification of the organisms causing vascular wilt diseases of elms in this country; of certain phases of infection by *C. ulmi*, particularly infection courts and the histopathology of the disease as related to the movement and spread of the fungus in the wood; and of the spread of the disease in local infection centers in Ohio, New Jersey, and Indiana.

The Dutch elm disease situation, W. O. FILLEY (*Conn. Woodlands, 1 (1936), No. 1, pp. 11, 12*).—This is a note by the Connecticut [New Haven] Experiment Station.

A leaf-spot disease of honey locust caused by a new species of Linospora, J. H. MILLER and F. A. WOLF (*Mycologia, 28 (1936), No. 2, pp. 171–180, figs. 2*).—

As a result of this cooperative study between the University of Georgia and Duke University, *L. gleditsiae* n. sp. is described as the perfect stage of the fungus known under the conidial form as *Melasmia hypophylla*. The perithecial stage develops on overwintered leaves. The genetic connection of the two stages was indicated by the development of the conidial stage on leaves that had been inoculated, using leaves bearing the perithecia. Attempts to culture *L. gleditsiae* were unsuccessful.

Although included in the Clypeosphaeriaceae, the authors believe that *Linospora* preferably should be placed nearer the members of the Diaporthaceae.

Studies on the wood-rotting fungus Fomes pini.—I, Variations in morphology and growth habit, C. E. OWENS (*Amer. Jour. Bot., 23 (1936), No. 2, pp. 144–158, pls. 9*).—This study by the Oregon Experiment Station was made on sporophores collected from 6 genera and 21 species of coniferous trees, chiefly from Oregon and other parts of the Pacific Northwest. The sporophores varied greatly in form and size and in the shape and dimensions of the pores, not only as between those collected on different host genera and species but also among those from a single host species. Strictly annual sporophores were not observed, though this is at variance with published accounts in Europe and America recognizing a variety, *F. pini abietis*, said to have annual sporophores on fir, spruce, and larch. On living trees in the Pacific Northwest the sporophores occur at branch stubs or knotholes on all host species observed except on *Abies grandis*, where they occur gregariously in large numbers scattered over extensive, cankerlike areas of the bark. Detailed descriptions of the sporophores are given.

Use of calcium cyanamid in control of nematodes, H. DUKES and H. SHERARD (*Fla. Grower, 44 (1936), No. 5, pp. 7, 19, figs. 2*).—This study at the University of Florida was undertaken to determine the effects of applications of the granular form of calcium cyanamide on *Heterodera marioni* under both field and greenhouse conditions. With okra and tomatoes as index crops in two respective greenhouse tests, the treatment controlled the nematodes for from 8 to 12 weeks, and when the application was made 30 days before planting no ill effects on the crops were noted. In field tests with beans as the index crop the treatment also retarded the nematode development for a time.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Regulations relating to game, land fur animals, and birds in Alaska, 1936–37 (*U. S. Dept. Agr., Bur. Biol. Survey, Alaska Game Comm. Circ. 18 (1936), pp. 32, fig. 1*).—This is a summary of the Alaska game law and regulations. The complete text of the law has been given in Circular 10 (E. S. R., 70, p. 498).

Food of Arctic birds and mammals collected by the Bartlett expeditions of 1931, 1932, and 1933, C. COTTAM (*Jour. Wash. Acad. Sci., 26 (1936), No. 4, pp. 165–177*).—A summary is given of the food percentages by volume as determined from the analysis of stomachs, gullets, or crops of 115 birds representing 21 species and 1 additional subspecies collected on the three Arctic expeditions of R. A. Bartlett in the summers of 1931, 1932, and 1933. Reference is also made to the stomach contents of a weasel and 5 Hudson Bay ground squirrels collected.

Studies on the endoparasitic fauna of Trinidad mammals, II, III, T. W. M. CAMERON (*Canad. Jour. Res., 14 (1936), Nos. 1, Sect. D, pp. 1–5, figs. 11; 4, Sect. D, pp. 25–38, figs. 26*).—In the second report of studies (E. S. R., 74, p. 545), entitled Additional Parasites from Trinidad Deer, *Setaria bidontata*

(Molin) and *Eucyathostomum longesubulatum* Molin are recorded from the deer *Mazama simplicicornis* and are redescribed together with a species of *Oxyuris* from the same host. The third contribution, Some Parasites of Trinidad Carnivores, presents descriptions of two new species of cestodes, five of nematodes, two of Acanthocephala, and one linguatulid taken from carnivores in Trinidad.

[Contributions on entomological technic] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1936, ET–79, pp. 3, pls. 2; ET–80, pp. 2, pls. 2; ET–81, pp. 3, pls. 2; ET–82, pp. 2; ET–83, pp. 2, pl. 1*).—Further contributions in this series (E. S. R., 75, p. 511) include the following: A Cage for Rearing Bark- and Wood-Boring Insects Under Field Conditions, by W. J. Buckhorn; An Inexpensive Constant-Temperature Oven, by R. A. Fulton; A Berlese Funnel for Collecting Smaller Soil Animals, by L. D. Christenson; A Method of Preparing Insect Specimens for Riker Mounts, by G. H. Kaloostian and H. C. Donohoe; and Apparatus for Placing Test Lots of Insects Within Parcels of Stored Tobacco During Fumigation Experiments, by W. D. Reed, E. M. Livingstone, and A. W. Morrill, Jr.

[Contributions on economic insects, insecticides, and insect control] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1936, E–372, pp. 4, pls. 2; E–373, pp. 7; E–374, pp. 2; E–375, pp. 2; E–376, pp. 14; E–377, p. 1; E–378, pp. 13, pls. 2; E–379, pp. 3, pls. 2; E–380, pp. 6; E–381, pp. 74; E–382, pp. 4, pls. 2; E–383, pp. 4*).—Further contributions in this series (E. S. R., 75, p. 511) are: The Black European Slug [*Agriolimax agrestis* L.], a Pest of Tobacco Plants, by J. N. Tenhet and J. Milam; The Control of Flea Beetles [Tobacco Flea Beetle and the Potato Flea Beetle] Attacking Tobacco in the Southern Tobacco-Producing Regions, by J. U. Gilmore and F. S. Chamberlin; Present Status of Pea Aphid Control on Canning Peas, Its Possibilities and Limitations, by J. E. Dudley, Jr.; Suggestions on the Use of Derris Sprays for Control of the Pea Aphid and Recommendations for the Control of Insects Attacking Certain Vegetables, Small Fruits, and Tobacco, both by W. H. White; Results of Tests of Phenothiazine for Codling Moth Control, by B. A. Porter; Present Status of the Alfalfa Weevil Problem with Particular Reference to Quarantines, by P. N. Annand; The European Spruce Sawfly [*Diprion polytomum* Htg.], by H. J. MacAloney; A Report on Certain Dusts Tested Against the Citrus Thrips on Orange Trees, by E. A. McGregor; A Bibliography of Cyanide Compounds Used as Insecticides, 1932, by H. L. Cupples (E. S. R., 75, p. 511); Progress in Dried Fruit Insect Investigations in 1935, by P. Simmons, D. F. Barnes, H. C. Donohoe, and C. K. Fisher (E. S. R., 74, p. 227); and How the Bureau of Entomology and Plant Quarantine of the United States Department of Agriculture Affects You, by L. A. Strong.

[Notes on economic insects and insecticides] (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 629–634*).—Notes here presented (E. S. R., 75, p. 511) include the following: Comparison of Tetrahydronaphthalene and Ethylene Dichloride-Carbon Tetrachloride Mixture as Fumigants Against [Webbing] Clothes Moth Larvae, by W. Colman (pp. 629, 630); Efficiency of *Trichogramma minutum* Riley in Relation to Population Density of Its Host, by G. W. Barber (p. 631); Nitrogen Trichloride as a Fumigant, by R. S. Woglum and H. C. Lewis (pp. 631, 632); New Nymphal-Adult Parasite [*Aphelopus typhlocybae* Mueseb.] of White Apple Leafhopper, by H. M. Steiner (pp. 632, 633), contributed from the New York State Experiment Station; Enemies of the Mexican Mealybug (*Phenacoccus gossypii* T. & Ckll.), by W. E. Heming (p. 633); and Insects Infesting Cotton Seed, by T. L. Bissell (p. 634), contributed from the Georgia Experiment Station.

[Contributions on economic insects] (*Amer. Fruit Grower, 56 (1936), No. 2, pp. 9–11, 13, 14, 16, 26, 29, 31–33, 34, 35, 39, 42, 44, 45, figs. 12*).—Contributions

presented include Codling Moth Control: A Discussion, by L. Childs (pp. 9, 29, 33, 35), contributed from the Oregon Experiment Station; Outsmart Codling Moth: Cut Infestations in Half by Orchard Sanitation, by D. L. Van Dine (pp. 10, 32, 39); Controlling Citrus Insect Pests in California, by R. H. Smith (pp. 11, 45), contributed from the California Citrus Experiment Station; Winning the Fight Against Apple Flea Weevil, by J. S. Houser (pp. 13, 26, 34), contributed from the Ohio Experiment Station; Hand Syringe to Modern Power Sprayers: The History of Nicotine Sprays, by J. Howard (pp. 14, 42); and Spray Service by Wire and Air, by W. H. Zipf (pp. 16, 31, 44).

[Contributions on economic entomology] (*Ztschr. Angew. Ent., 22 (1935), Nos. 1, pp. 1–160, figs. 46; 2, pp. 165–330, figs. 59; 3, pp. 331–513, figs. 49; 22 (1936), No. 4, pp. 521–652, figs. 36*).—The contributions presented (E. S. R., 73, p. 644) are as follows:

No. 1.—The Egg Development of the Mediterranean Flour Moth at Constant and Fluctuating Temperatures, I, by A. D. Voûte (pp. 1–25); Observations on the Biology of *Bruchus obtectus* Say, With Special Reference to the Nutritional Factors, by G. M. Herford (pp. 26–50) (in English); The Selection System in Cockchafer-Infested Forests, by Puster (pp. 51–60); The Life History, Economic Importance, and Control of *Cerambyx cerdo* L., by D. F. Rudnew (pp. 61–96); The Causes of Hibernation of the Gypsy Moth, the nun moth, and Other Lymantriids in the Egg Stage, by K. Tuleschkov (pp. 97–117); Contribution to the Control of the Cabbage Maggot (*Phorbia brassicae* Bouché) by Sprays and Dusts, by H. Gasow (pp. 118–130); The Distribution of Tabanidae in the Dutch East Indies and Its Economic Importance, by O. Nieschulz (pp. 131–142); The Organization of the Entomological Service in Canada, by K. E. Schedl (pp. 143–156); and The Bark Beetles and Their Host Plants (Remarks and Supplements to Kleine's Paper of the Same Title (E. S. R., 73, p. 644)), by A. Pfeffer (pp. 157–160).

No. 2.—The Egg Development of the Mediterranean Flour Moth at Constant and Fluctuating Temperatures, II, by A. D. Voûte (pp. 165–184) (see above); The Leaf-Cutting Ant *Atta sexdens* L., Particularly Its Ecology, I, by H. Eidmann (pp. 185–241); A Contribution to the Question of Races in *Culex pipiens*, by A. de Buck (pp. 242–252); Contributions to the Natural History of Sawflies, by C. S. Hsin (pp. 253–294); and The Control of Animal Pests of Asparagus, by M. Dingler (pp. 295–330).

No. 3.—Physiological Investigations of the Action of Ecological Factors, Particularly Temperature and Humidity, on the Development of *Diprion (Lophyrus) pini* L. in Determining the Causes of Variation in Abundance, by K. Gösswald (pp. 331–384); Knowledge of the Leaf-Cutting Ant *Atta sexdens* L., Particularly Its Ecology, II, by H. Eidmann (pp. 385–436) (see above); The Sensitivity of the Leaf-Cutting Ant *Atta sexdens* L. to Poisonous Gases, by H. Schmalfuss (pp. 437–451); The Question of the Vital Optimum Temperature—V, The Relation in Insects of the Speed of Development to the Vital Optimum, by I. W. Kozhantschikow (pp. 452–462) (E. S. R., 72, p. 217); The Beet Root Weevil *Bothynoderes punctiventris* Germ. in Turkey, by F. Eckstein (pp. 463–507); and A Contribution to the Study of the Death of Elms in Czechoslovakia (pp. 508, 509), The Two Spruce Nest Worms *Epiblema tedella* Cl. and *E. proximana* Hw. (pp. 510, 511), and Parasite Rearing by the Government Forest Protection Experiment Station in Praha (Prague) (pp. 511–513), all by K. E[scherich].

No. 4.—The Development of the Pine Sphingid *Sphinx pinastri* L. as Affected by Temperature and Humidity, by K. Gösswald (pp. 521–532); The Temperature Dependence of the Nun Moth *Lymantria monacha* L. (Vital Zone,

etc.), by F. v. Arnim (pp. 532–557); Results of Parasite Rearings (pp. 558–564) and The Outbreak of the Fir Shoot Tortricid (*Cacoecia murinana* Hübn. in Niederösterreich (Lower Austria) in 1929–34 (pp. 565–602), both by E. Schimitschek; Experimental Control of the Granary Weevil With Dust Insecticides, by B. Germar (pp. 603–630); *Syntomaspis eurytomae* n. sp., a Chalcid With a Mixed Diet in the Larval Stage, by E. W. Puzanova-Malysheva (pp. 631–642); and The Black Spruce Bark Beetle *Hylastes cunicularius* Er., by K. Eckstein (pp. 643–652).

Connecticut State entomologist, thirty-fifth report, 1935, W. E. Britton (*Connecticut [New Haven] Sta. Bul. 383 (1936), pp. 245–366+XI–XVI, figs. 29*).—Entomological features of 1935 (pp. 249–251) (E. S. R., 73, p. 641); insect record for 1935 (pp. 252–267); inspection of nurseries, 1935, by Britton and M. P. Zappe (pp. 269–278), and of apiaries, by Britton (pp. 279–285); report of control of the gypsy moth, by Britton, J. T. Ashworth, and O. B. Cooke (pp. 285–291), present status of mosquito control work in Connecticut, by R. C. Botsford (pp. 292–301); European corn borer control, by Britton, Zappe, and N. Turner (pp. 301–303); and Japanese beetle work in Connecticut, by J. P. Johnson (pp. 304, 305), are first presented. Then follow reports on tests of apple sprays, by Zappe and E. M. Stoddard (pp. 305–308); the European spruce sawfly *Diprion polytomum* Htg. in Connecticut, where it was first found in October 1934 (pp. 308–312), and notes on a scale insect new to Connecticut, *Matsucoccus matsumurae* Kuwana (p. 313), both by G. H. Plumb; white grub (*Phyllophaga fusca* Froh.) injury to seedling apple and pear trees (pp. 313–315), studies in breeding and control of the apple maggot (pp. 315–320) (see p. 671), continued study of arsenical burn on peach trees (pp. 320–322), further notes on spray residues for 1935 (pp. 322–324), continued tests with substitutes for lead arsenate (p. 324), and report on parasite work for 1935 (pp. 325, 326), all by P. Garman; clusters of flies (*Atherix variegata* Walk.) mistaken for rust patches, by Britton (pp. 326, 327); notes on the hairy chinch bug *Blissus leucopterus hirtus*, a pest of lawns, by B. H. Walden (pp. 328, 329); further infestations of *Calomycterus setarius* Roelofs, by Zappe (pp. 329, 330); note on *Tetralopha robustella* Zell. in Connecticut (Pyralidae, Lepidoptera), by Plumb (pp. 331–333); further observations on the squash bug in Connecticut, by R. L. Beard (pp. 333–339); further observations on termite (*Reticulitermes flavipes* Kollar) damage, by Turner and Zappe (pp. 340, 341); the relation between the hibernating female and the survival of the spring generation of the spruce gall aphid *Adelges abietis* L., by R. B. Friend (pp. 341–344); cooperative European corn borer egg parasitism investigation, by J. C. Schread (pp. 344–346), and conditioning a basement room for breeding insects, by J. F. Townsend (pp. 346–350).

The report concludes with miscellaneous insect notes (pp. 350–362), including the black widow spider *Latrodectus mactans* Fab., damage by the strawberry weevil, an outbreak of Say's blister beetle, the bagworm in New Haven, a borer in cattail (*Nonagria oblonga* Gr.), a leaf miner of chrysanthemum (*Agromyza maculosa* Malloch), the abundance of a white geometrid moth (*Physostegania pustulata* Guen.) and of the elm lacebug *Corythucha ulmi* Osb. & Dr., injury to rhododendron seedlings by *Oniscus asellus* L., structural wood injured by powder-post beetles (*Lyctus* sp.), the forest tent caterpillar, elm spanworm, prevalence of the fall cankerworm, lime tree looper, elm leaf aphid *Myzocallis ulmifolii* Monell, control of rosy apple aphids with California ladybeetles (convergent ladybeetle), plant bug (*Lygus* spp.) injury to fruit, abundance of eastern tent caterpillar, a leaf tier (*Plutella porrectella* L.) of sweet rocket, worms (European corn borer) in cake, injury to vegetables by the

garden millepede *Julus hortensis* Wood, the house centipede, the fruit tree leaf roller, and the black carpenter ant.

[Report of work with insect pests and rodents by the Florida Station] (*Florida Sta. Rpt. 1935, pp. 64, 65–69, 84, 100, 109–112, 115, 116, figs. 2*).—The work of the year with insect pests and rodents and their control (E. S. R., 73, p. 204) referred to includes the Florida flower thrips *Frankliniella cephalica bispinosa* Morg., by J. R. Watson; the introduction and propagation of beneficial insects (*Leis dimidiata* var. *15-spilota* Hope), by Watson and W. L. Thompson; the larger plant bugs (leaf-footed bugs, *Acanthocephalus fermorata*, *A. confraterna*, and the southern green stinkbug), by H. E. Bratley; potato leafhopper investigations, by A. N. Tissot; the green citrus aphid *Aphis spiraecola* Patch, by Watson and Thompson; the pecan nut casebearer, by Watson and G. B. Fairchild; the onion thrips, by Watson; the gladiolus thrips, by Watson and J. W. Wilson; biology and control of Florida aphids, by A. N. Tissot; an electrical method for determining concentration of hydrocyanic acid gas in air mixtures, by R. J. Wilmot; control of the purple scale and white flies with lime-sulfur at the Citrus Substation, by Thompson; and miscellaneous insect pests and their control, the prevalence and control of the sugarcane borer in south Florida, and the prevalence and control of rodents under field and village conditions, all by R. N. Lobdell at the Everglades Substation.

[Report of work in entomology by the Idaho Station] (*Idaho Sta. Bul. 220 (1936), pp. 30–34, fig. 1*).—The work with economic insects referred to includes beet leafhopper control, biological control of fruit insects, unsuccessful eradication of the cherry fruitfly, effective use of cube kaolin dust against several insects, grasshopper control, introduction of the European earwig parasite *Digonichaeta setipennis* Fall., physiological studies of the effect of poisons on insects, ladybeetle predators for the pea aphid, increased resistance by certain onion varieties to onion thrips, favorable hibernation important to the pea weevil *Triaspis thoracicus* Curt., spray combinations and codling moth control, control of the European elm scale by summer sprays, and increase of wireworms in red clover or sweetclover fields.

[Report of work in entomology by the Michigan Station], R. HUTSON (*Michigan Sta. Rpt. 1935, pp. 218, 219*).—Brief reference is made to the work of the year (E. S. R., 73, p. 505) with zinc arsenate for control of codling moth, the control of the tarnished plant bug, aphids, and cutworms, and observations on grasshoppers.

[Report of work in economic entomology by the Montana Station] (*Montana Sta. Rpt. 1934, pp. 36–40*).—The work of the year with insects and insect control is briefly referred to, including insecticides, identification of insects, and prediction of grasshopper outbreaks.

[Work in economic entomology and zoology by the New Jersey Stations] (*New Jersey Stas. Rpt. 1935, pp. 18–20, 38–46*).—This report (E. S. R., 73, pp. 203, 205) refers to work on the biology of the oyster; mosquito investigations and control; the effect of low frequency alternating current upon Japanese beetle grubs and earthworms in soils; the effect of high frequency electric current on bacteria; the effect of infrared oscillation on insects and their food; investigations of codling moth, leopard moth, spray injury, derris, cube root, *Cracca virginiana*, anabasine sulfate, and a large number of other new insecticides involving organic and inorganic chemicals, new wetting agents to be used in place of soap, nicotine fumigation for control of mushroom flies, paradichlorobenzene for control of wireworms, and control of strawberry rootworm and boring insects in trees and shrubs; and bee investigations.

[Report of work in economic zoology by the South Dakota Station], H. S. SEVERIN (*South Dakota Sta. Rpt. 1935, pp. 26–30*).—The work of the year

referred to (E. S. R., 73, p. 205) includes that on the economic importance, distribution, life history, and control of cyrtacanthacrine grasshoppers; insects as pollination agents of sweetclover; and the economic importance of blister beetles.

Effect of orchard practices on codling moth and leafhopper parasitism, B. F. DRIGGERS and B. B. PEPPLE (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 477–480*).—At the New Jersey Experiment Stations codling moth eggs exposed for 3 days showed low parasitism by *Trichogramma* sp. in a heavily sprayed orchard and high parasitism in an unsprayed orchard. Larval and pupal collections in late summer in three orchards showed more parasitism in a heavily sprayed and weedy orchard than in a heavily sprayed and clean-cultivated orchard and four and one-half times as much larval parasitism in an unsprayed and uncultivated orchard.

"Three plats of apple trees receiving different spray treatments following petal fall varied in leafhopper [mostly apple leafhopper] population and the percentage of leafhopper parasitism. Low leafhopper parasitism was correlated with high leafhopper populations. The highest percentage of parasitism and the lowest leafhopper population was found on the plat receiving no spray treatment following petal fall. The plat sprayed with lead arsenate-oil for first brood and nicotine tannate for second brood, while not as high in parasitism as the plat unsprayed following petal fall, showed one-sixth the population and 14 times the parasitism found on the plat sprayed with lead arsenate-oil during first and second brood."

Feeding and utilization of sucrose solutions by potato flea beetle and fall webworm: Feeding insecticides to flea beetle, D. O. WOLFENBARGER (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 586–589, figs. 2*).—A discussion is given of a method of feeding insects with biting mouth parts that has been employed with success. The potato flea beetle lived considerably longer on sucrose solution than water alone, and longer on water than in the starvation check. Barium fluosilicate was the most toxic of the inorganic poison materials tested. Beetles sprayed and dusted with bordeaux mixtures, alone and in combinations with some common stomach poisons, lived almost as long as those in the water check. Beetles sprayed with 5–5–50 bordeaux combined with calcium arsenate, however, did not live as long as those in the water check.

Reference is also made to the maintenance of life of fall webworm larvae by consumption of a 20 percent sucrose solution.

Determination of the less refined mineral oils on leaf surfaces after spraying, L. H. DAWSEY (*Jour. Agr. Res. [U. S.], 52 (1936), No. 9, pp. 681–690, fig. 1*).—This further study (E. S. R., 60, p. 12) reports upon the determination of the less refined petroleum oils in the presence of materials extracted from plant foliage by ethyl ether.

"Treatment of the leaf extract residues containing petroleum with nitric acid under controlled conditions results in destruction of a definite proportion of the oil each time, and by using a predetermined correction factor the original quantity of the oil present can be estimated. Applications are suggested in the determination of oil deposit from the foliage of camphor-tree, Satsuma orange, and chrysanthemum plants following spraying with oil emulsions. The method of analysis of these sulfonatable oils in the presence of chrysanthemum leaf materials has been simplified, without loss of accuracy, by omitting the usual wax-freezing step as employed in the treatment of the camphor-tree and Satsuma orange leaf extracts. The efficiency in oil recovery in washing leaf disks taken from sprayed plants with ethyl ether has also been studied. For a limited number of washings recovery is not complete, but from 90

to 95 percent of the oil is removed even when extraction is made 24 hr. after the spray application.

"The work of other investigators is discussed in the light of the present work, and the position taken that the total oil deposit is the preferable quantity to measure in the study of the insecticidal action of oils."

A list is given of eight references to the literature cited.

An account of the constitution and use of an atomised white oil, pyrethrum fluid, to control Plodia interpunctella Hb. and Ephestia elutella Hb. in warehouses, C. POTTER (*Ann. Appl. Biol., 22 (1935), No. 4, pp. 769–805, pls. 3, figs. 4*).—Following a brief account of the life history of the tobacco moth and the Indian meal moth in London warehouses, an account is given of a pyrethrum fluid insecticide, the technic of application, and the results of tests of its value in combating the infestation of imported stored products in warehouses. A list of 29 references to the literature is included.

Insect damage to seeds of Cracca virginiana L., J. S. YIP (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 622–629, figs. 2*).—In the course of an investigation of *C. virginiana*, a native North American perennial leguminous weed occurring from Canada to Florida, Texas, and Mexico, with regard to its possibilities as an insecticide, the seed was found to be widely damaged by insects, the more common of which are *Apion scgnipes* Say, the bean weevil, and *Ulophora tephrosiella* Dyar. The number of parasites of these pests is very low. Information thus far obtained shows that the larvae of *A. segnipes* and *U. tephrosiella* do much damage to the seed, and that little damage is caused by the bean weevil.

Stickers for derris applied as an insecticide spray, L. D. GOODHUE and W. E. FLEMING (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 580–583*).—In laboratory work aimed at the development of a suitable sticker for derris when used as an insecticide spray for control of the Japanese beetle, several oils, waxes, resins, agar-agar, and other materials were tested on glass plates and the most promising then tested on bean foliage. Rosin residue, the residual material left in the still during the manufacture of rosin, when emulsified with ammonium caseinate was found to be the most satisfactory and inexpensive sticker for derris.

The toxic effects of naphthalene on Bruchus obtectus and Tenebrio molitor in various stages of development, L. PYENSON and G. F. MACLEOD (*Jour. Agr. Res. [U. S.], 52 (1936), No. 9, pp. 705–713, figs. 2*).—A study of the toxicity of naphthalene to the bean weevil and the yellow mealworm in their various stages of development, conducted by the [New York] Cornell Experiment Station in cooperation with the Instituto de Pesquizas Agronomicas, Pernambuco, Brazil, is reported.

In experimental work with eggs of the two insects the toxicity of the naphthalene was found to vary with the age of the eggs. The rate of respiratory metabolism of the eggs measured by the percentage of daily loss in weight was directly related to lethal dosages of naphthalene. "An increased loss in weight was associated with a greater toxicity of naphthalene to the eggs. The development of bean weevil eggs was noticeably retarded by sublethal exposure to naphthalene vapor. The developmental rate of mealworm eggs was not significantly affected by sublethal exposures to naphthalene. Eggs and very young larvae of the mealworm when fumigated with naphthalene turned reddish brown, the color intensity varying directly with the period of exposure.

"Experiments with larvae of the mealworm showed that the toxicity of naphthalene decreased with increased age and weight of the larvae. Sublethal exposures of mealworm eggs or young larvae to naphthalene did not affect subsequent growth.

"Resistance to naphthalene varied greatly between instars of the more advanced stages of the mealworm. The order of susceptibility of all the stages of the mealworm to naphthalene from least to greatest resistance was: (1) Eggs, (2) young larvae, (3) adults, (4) prepupae, (5) pupae, [and] (6) mature larvae. Increased respiratory metabolism as measured by percentage daily loss in weight appeared to be related to increased toxicity of naphthalene with the different stages of the mealworm.

"In experiments with several species of adult insects and closely related organisms, Diptera were most susceptible to naphthalene while Coleoptera were most resistant.

"Injections of olive oil solutions of naphthalene into mealworm pupae produced the same toxic effects as when the pupae were exposed to naphthalene vapor. Naphthalene was a slow-acting poison to the pupae even when injected into the body. The nervous and muscular systems were not the first tissues to be affected, as shown by the wriggling movements of the darkened, dying pupae when touched. Fat bodies were probably the first tissues to be affected, since they appeared to be partly disintegrated and discolored in treated larvae and pupae."

Persistence of toxicity of nicotine-bentonite on apples, W. MOORE (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 590–594*).—In the experiments reported the toxicity of nicotine-bentonite was not destroyed by sunlight. The persistence of its toxicity on apples compared favorably with that of arsenate of lead-lime-milk.

Constituents of pyrethrum flowers.—II, Isolation of pyrethrin II, F. B. LAFORGE and H. L. HALLER (*Jour. Amer. Chem. Soc., 57 (1935), No. 10, pp. 1893–1896*).—Reporting further (E. S. R., 75, p. 160), a procedure for the preparation of pyrethrin II is described. "Petroleum ether extractives of pyrethrum flowers are separated from fats and waxes by the employment of acetic acid. The acids are removed from the concentrate by extraction in aniline solution with potassium carbonate. Partial separation of pyrethrin II from pyrethrin I is accomplished by taking advantage of their different solubilities in a system consisting of diluted acetic acid and petroleum ether. Pyrethrin II tends to concentrate in the acid solution, pyrethrin I in the petroleum ether. Concentrates so obtained containing about 80 percent of pyrethrin II and about 6 percent of pyrethrin I are distilled in a molecular still and yield pure pyrethrin II."

Constituents of pyrethrum flowers.—III, The pyrethrin content of fresh flowers, F. ACREE, JR., P. S. SCHAFFER, and H. L. HALLER (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 601–605*).—A study was made of pyrethrum flowers (see above) to determine if the pyrethrins are present in the fresh flowers, and if so, to what extent they are affected by enzyme activity and moisture content in the process of drying. The finding by Gnadinger et al. (E. S. R., 70, p. 53) that the method of drying produces very little variation in the pyrethrin content is confirmed. It is shown that the pyrethrin I and pyrethrin II exist as such in the fresh pyrethrum flowers. Enzymes and moisture have a negligible effect on the synthesis or decomposition of the pyrethrins in the process of drying the flowers.

Pyrethrin content of pyrethrum flowers from various sources, D. G. HOYER and M. D. LEONARD (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 605, 606*).—The results of an assay of the toxic value of prethrum flowers from various sources, in which 5-day-old houseflies were used and the sprays were prepared by extracting the ground flowers with kerosene at the rate of 1 lb. per gallon, are reported.

Insecticidal activity of aliphatic thiocyanates.—III, Red spiders and mites, D. F. MURPHY (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 606–611*).—Laboratory and field tests here reported (E. S. R., 70, p. 208) have demonstrated that B butoxy B′ thiocyanodiethylether at 1 : 800 when properly emulsified and used with a spreader successfully controls the common red spider. Tests conducted under field conditions on the European red mite on apples indicate that B butoxy B′ thiocyanodiethylether at 1:2,400 when properly emulsified and used with a spreader gives good control. The thiocyanate may be used with lime-sulfur or flotation sulfur to make a combination contact insecticide and fungicide. Preliminary tests indicate that the thiocyanate at 1:800 will destroy about 70 percent of the eggs of the red spider. Further work must be done on this phase of the problem.

Relative toxicity at high percentages of insect mortality, H. H. SHEPARD (*Nature [London], 134 (1934), No. 3383, pp. 323, 324, figs. 2*).—In this contribution from the Minnesota Experiment Station it is pointed out that estimates of the relative toxicity of insecticides have been made largely on the basis of amounts required to kill only half of an insect population. Mathematical considerations prevent high precision in determining the lowest amount to kill an entire population. An easy method is given in this paper by which good approximations of high percentages of mortality may be calculated from certain predetermined points on the toxicity curve.

Studies of seasonal occurrence of injuries to potato tubers in western New York, F. G. BUTCHER (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 486–490, figs. 2*).—Investigations of scab, scab gnat, and millepede injuries to potato tubers conducted in Monroe County, N. Y., in the past 4 yr. are considered, the results being presented in table and graph form. The scab gnat injuries appeared to follow scab infection, but since the proportion of injured tubers remained constant during the middle of the season and later actually decreased, it was apparent that millepedes also feed on the portions of the tubers injured by scab gnats.

A contribution to the knowledge of sugar-beet insects in Ontario, G. M. STIBBETT (*Sci. Agr., 16 (1935), No. 4, pp. 180–196*).—Following a brief reference to the importance and history of sugar beet production in Ontario, this contribution presents a historical review of and incidental notes on sugar beet insects in Ontario; results of regular collections of insects from sugar beet fields, of which the details are presented in two tables; collections from various fields in Chatham district; beneficial insects of sugar beet fields; an annotated catalog of invertebrates associated with the beet plant in Ontario; and a list of 36 references to the literature.

The effect of the freeze of December 12 and 13 on citrus pests in Florida, W. W. YOTHERS and M. R. OSBURN (*Fla. State Hort. Soc. Proc., 48 (1935), pp. 122–126*).—The results of observations of the effect on important citrus insects of the freeze of December 12 and 13, 1934, when the temperature fell to 22° F., are reported, the details being given in tables. Similar studies were conducted in 1917 (E. S. R., 43, p. 554).

The data indicate that the direct effect of the freeze on the citrus white fly pupae, which insect occurs as far north as North Carolina, amounted to very little, it being doubtful if the cold killed any pupae other than those deprived of normal food supply by defoliation. The purple scale is much more resistant to the low temperature of 22° than the Florida red scale. Examination made of the respective species in the same grove showed that 71.7 percent of the purple scales and only 28.5 percent of the red scales survived. The low temperatures actually froze some rust mites, but great numbers were

also left and were present on completely frozen fruit immediately after the freeze. After the freeze several living specimens of *Tenuipalpus irritans* and *Tetranychus citri* were found, and it is very doubtful if very many of these were frozen. While papaya plants in central Florida were killed to the level of the ground by the freeze, a large percentage of the larvae of the papaya fruitfly in the fallen fruit survived. The observations indicate that little or no mortality of the rust mite is caused by the sulfur dust during low temperatures.

Studies conducted by Watson during this period have been noted (E. S. R., 73, p. 348).

The trend of citrus insect control in Florida, J. R. WATSON (*Fla. State Hort. Soc. Proc., 48 (1935), pp. 91–93*).—This discussion is contributed from the Florida Experiment Station.

The control of purple scale and rust mites with lime-sulfur solution, W. L. THOMPSON (*Fla. State Hort. Soc. Proc., 48 (1935), pp. 98–107*).—This is a practical contribution from the Florida Experiment Station, based upon investigations a detailed report of which has been noted (E. S. R., 74, p. 230).

Shade-tree insect developments, E. P. FELT and S. W. BROMLEY (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 490–492*).—A discussion of important shade tree insect developments in 1935 (E. S. R., 73, p. 348).

Fumigation of flour mills with hydrocyanic acid gas, R. T. COTTON, H. D. YOUNG, and G. B. WAGNER (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 514–523, figs. 4*).—Data on the efficiency of fumigation with hydrocyanic acid gas as affected by the methods of producing and applying the gas, the type of construction of the building, the preparation of the mill, wind velocity, etc., observed in many mill fumigations in the middle western United States and extending over a period of two seasons are reported upon. Observations were made as to the relative cost and as to the efficiency of the fumigations in terms of insects killed and in gas concentrations obtained. The details are given in three tables and a number of graphs.

Killing insects in empty grain bins, H. H. SHEPARD (*Grain and Feed Journs. Cons., 73 (1934), No. 12, p. 511; abs. in Minnesota Sta. Rpt. 1935, p. 46*).—Attention is called to the misuse of contact insecticides for the control of grain insects and the importance of distinguishing between contact insecticides and insect fumigants. The use of kerosene as a contact insecticide is discussed with particular reference to its inflammability.

Possible insect carriers in the 1933 outbreak of encephalitis in Columbia, Mo., L. HASEMAN (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 618–621*).—In reporting upon a study made by the Missouri Experiment Station of an outbreak of encephalitis at Columbia, Mo., in 1933, which followed a much heavier epidemic in St. Louis and vicinity, three groups of insects are said to have been found outstanding at the beginning of or throughout the epidemic, namely, mosquitoes, leafhoppers, and the large bluebottle or blowflies (*Cynomyia cadaverina* R. D., *Calliphora erythrocephala* Meig., and *Phormia regina* Meig.).

The significance of the dragonfly name "Odonata", C. E. MICKEL (*Ann. Ent. Soc. Amer., 27 (1934), No. 3, pp. 411–414; abs. in Minnesota Sta. Rpt. 1935, p. 16*).—This contribution discusses the derivation and meaning of the dragonfly ordinal name Odonata.

Effect of thrips on pollination and blossom blight in strawberries, M. D. FARRAR (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 483–486, fig. 1*).—The flower thrips drifting into strawberry beds in Illinois cause a rapid increase in population during the early bloom; during the height of the bloom the numbers per bloom decrease, but again increase rapidly late in the season when few blooms are present. Both laboratory and field experiments indicate that the so-

called blight which they cause occurs on infested and weak blooms, the stronger blooms pollinating and producing fruit irrespective of thrips populations. They have been found to be only a minor limiting factor in the pollination and the production of fruit under field conditions.

Notes on the louse problem of a municipal workhouse, M. J. OOSTHUIZEN and H. H. SHEPARD (*Jour. Parasitol., 21 (1935), No. 4, pp. 318, 319; abs. in Minnesota Sta. Rpt. 1935, p. 44*).—The results of daily examinations of transients at the Minneapolis workhouse for lice infestation over a period of 20 mo. are briefly reported. During that period 7,818 men were examined, of whom 23.8 percent were found infested.

Parasitism of the apple leaf hopper (Typhlocyba pomaria) by Entomophthora, S. A. WINGARD (*Phytopathology, 26 (1936), No. 2, p. 113*).—Brief reference is made to the finding that the white apple leafhopper in Virginia apple orchards was destroyed by the fungus parasite *E. sphaerosperma* following an almost continuous rainfall the first week of September 1935, which prevented the application of sprays.

Biological control of the sugar cane leafhopper in Hawaii, O. H. SWEZEY (*Hawaii. Sugar Planters' Sta., Ent. Ser. Bul. 21 (1936), pp. [2]+57–101, figs. 29; also in Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 40 (1936), No. 1, pp. 57–101, figs. 29*).—The introductory part of this contribution takes up the early history of leafhoppers in Hawaii, plans for importation of parasites, and the organization and details of the work.

An account is then given of the parasites introduced, eight in number, namely: *Paranagrus optabilis, P. perforator, Anagrus frequens, Ootetrastichus beatus, O. formosanus, Haplogonatopus vitiensis, Pseudogonatopus hospes,* and *Cyrtorhinus mundulus.* The natural enemies that were already present in Hawaii, some 20 in number in addition to spiders, and the enemies of spiders are then considered.

A brief reference is made to fungus diseases of the leafhopper. A list is given of the literature cited and bibliography, together with an appendix dealing with the distribution of 23 leafhoppers of the genus *Perkinsiella,* chiefly sugarcane-infesting forms.

Experiments with derris as a control for the pea aphid, J. E. DUDLEY, JR., T. E. BRONSON, and F. E. CARROLL (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 501–508*).—Greenhouse experiments with the pea aphid demonstrated that ground derris, applied as a spray at the rate of from 0.25 to 5 lb. per 100 gal. (0.0009 to 0.022 percent of rotenone) with a spreader and wetting agent, killed more than 90 percent of the aphids on the treated plants. The aphids died during a period of from 3 to 5 days, and practically no reproduction occurred in the interim.

"A large number of tests on late-planted peas revealed that derris as a spray, with a spreader and wetting agent, applied prior to aphid infestation, protected the plants from appreciable damage for several weeks and resulted in an ultimate infestation considerably lower than had developed in the untreated checks; that heavy applications of derris sprays after the incidence of an infestation protected peas from damage from a commercial standpoint for nearly a month, enabling them to produce a normal crop of pods; that heavy applications of derris sprays with any one of several spreaders and wetting agents, made after the infestation had become heavy, killed approximately 95 percent of the aphids; that derris sprays controlled the aphid more quickly and to a higher degree than did derris dusts; and that concentrations of derris as low as 0.25 to 0.5 lb. (0.0009 to 0.0019 percent rotenone) per 100 gal., with spreaders and wetting agents, killed approximately as large a percentage of aphids as did 8 lb. per 100 gal.

"On the basis of the experiments reported herein, it appears that sprays of ground derris root containing 0.0044 percent rotenone, or possibly lesser concentrations, with a spreader and wetting agent, applied to pea vines while aphids are present in small numbers, give promise of effective control of the pea aphid."

Tar-oil and lubricating-oil sprays in relation to rosy aphid control and to winter-injured trees, F. Z. HARTZELL (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 556–561, fig. 1*).—This contribution from the New York State Experiment Station presents the results of a series of tests with tar oil and lubricating oil sprays applied in the spring of 1935 to determine their relative insecticidal efficiencies on the rosy apple aphid and their effects on apple trees which had a single growth period following a severe winter. An earlier account by the author et al. of the climatic conditions in western New York in 1933 and 1934 and the effects on fruit trees has been noted (E. S. R., 73, p. 342).

A concentration of 2.4 percent of creosote oil appears to be a practical amount to secure a high degree of control. In a tar-lubricating oil spray the toxic effects on aphid eggs apparently depend entirely upon the concentration of creosote oil and are not increased by the lubricating oil present, at least when the latter does not exceed 3 percent. The similar results secured, at the same dilutions of creosote oil, with all commercial brands and with tank-mixed emulsions, indicate that either all the manufacturers have used creosote oil which meets the standards proposed in 1934 or that the differences are not sufficient to affect the control of the aphid.

Cresylic acid in lubricating oil applied during the early green-tip stage gave more variable control than did creosote oil. Similar results have been secured in more extended tests during the past 6 yr. Notwithstanding its defects, cresylic acid and lubricating oil may have a place in the spray program

"Nicotine sulfate, 1:800 in 3 percent lubricating oil, applied during the green-tip stage, gave results similar to cresylic acid and oil. When used at a concentration of 1:400 excellent control was obtained. These results are similar to those secured in more extensive field tests during the past 4 yr. and indicate that these mixtures may help to extend the period for rosy aphid control."

In 1934 a number of trees were sprayed with creosote oil, lubricating oil, or a combination of both oils, and considerable twig injury resulted where the concentrations were in excess of 3 percent. Since no twig injury occurred in 1935, at similar concentrations, apparently the trees tolerated heavier dosages in 1935 than in 1934.

Apparently creosote oil and lubricating oil, when either was used alone, were quite similar in their effects on set of fruit. Water-gas tar oil appears to have been less toxic to the fruit buds than creosote oil when both were used at the same concentration.

A graph is given which shows the stages of the apple buds during periods when the several mixtures for the rosy apple aphid, eye-spotted budmoth, and San Jose scale should be applied and the average dates during the past 5 yr. when these conditions were found at Geneva, N. Y.

Comstock's mealybug as an apple pest, A. M. WOODSIDE (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 544–546*).—An outbreak of *Pseudococcus comstocki* Kuw. occurred in apple orchards in a restricted area of Albemarle County, Va., in 1934, and caused heavy losses. A dormant spray containing 4 percent of tar oil and 2 percent of petroleum oil applied after the trees had been scraped thoroughly and the larger masses of eggs removed gave good control. Nicotine sprays applied during the period of the first two cover sprays were also effective. Late summer applications for the second brood were not satisfactory

because many of the insects were within the calyxes, where they could not be reached.

Effect of oil spray on California red scale at various stages of development, W. EBELING (*Hilgardia [California Sta.], 10 (1936), No. 4, pp. 95–125, figs. 11*).—Experiments were made with a view to determining (1) the extent to which the settling of California red scale crawlers is inhibited by oils of various degrees of heaviness and sprays at different concentrations, and (2) the effect of oil sprays on both immature and adult stages.

Experimental data presented confirm the preliminary observation that the ultimate effect of oil spray on a red scale population is also influenced by the inhibition of the settling of crawlers for some time after the oil spray is applied. The data obtained indicate that where the normal amount of oil is deposited in the application of oil spray under orchard conditions there is a great reduction, for at least a month after the spray is applied, in the percentage of crawlers able to settle on the foliage. Among the crawlers able to settle and form whitecaps during this interim, there is a greater mortality than where oil spray has not been applied.

Attempts at control of the red scale with dusts directed against the crawlers have been unsuccessful because of practical considerations. All immature stages of the red scale are more easily killed by oil spray than the mature adult, probably because they are not as thoroughly sealed to the substratum upon which they rest and because their spiracles are not as far from their margins; they are thus more accessible to the oil.

"The majority of adult scales are killed by tracheal penetration of the oil, although, at least on the bark, a large percentge of them die from an oil spray treatment without tracheal penetration. Adult red scales with their margins loosened or lifted from their substratum are more vulnerable to oil sprays than are those not treated in this manner. It has been demonstrated that oil penetrates through the armor of the red scale. The armors of adult scales were painted with oil, care being taken that no oil should enter beneath the bodies of the insects. In two experiments, 5.64 and 17.78 percent of the insects treated in this manner were killed by the treatment in 16 days and 44 days, respectively. Those alive at the end of 2 weeks gave birth to a certain percentage of dead embryos and dead crawlers, as is typical of insects surviving the usual spray treatment.

"Red scale were found to live in an oxygen-free atmosphere for as long as 26 hr. Immersed in oil, however, they were found to live as long as 72 hr. A certain percentage of the porgeny of adult scales receiving a sublethal dosage of oil spray die before they are born; some of these are born before they have developed the usual insectan appendages. Because of the absorption of oil by the rough bark, and possibly also because of a lighter deposit of oil caused by the nature of the surface of the bark on the larger branches of citrus trees, it is on these parts of the trees that the greatest difficulty is experienced in the control of scale insects."

Tests of possible substitutes for hydrocyanic acid in fumigation of California red scale, H. L. CUPPLES, H. R. YUST, and J. HILLY (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 611–618*).—The details of toxicity tests on the California red scale with more than 300 chemical compounds are reported.

"Comparatively few of the compounds tested showed a substantial toxic action to the California red scale, and no compound which was not toxic to the scale was found to be markedly effective with hydrocyanic acid. Ethylene oxide is moderately toxic, but concentrations sufficient to kill the scale will injure the foliage. Chloropicrin is toxic to the scale, but also readily

burns the fruit. Practically a complete kill of scale was obtained with hydrogen sulfide at a dosage of 25 percent by volume for 25 min., but, although we have made no tests on foliage with this compound, it is believed that such a dosage would severely injure citrus vegetation. . . .

"We have found that various thiocyanates and isothiocyanates are toxic to the red scale at moderate concentrations, and of these two classes of compounds the former has seemed superior because less injurious to citrus fruit and foliage. Both methyl and ethyl thiocyanates have shown a high toxicity to the scale, with the methyl compound having the advantage of a lower boiling point. Methyl thiocyanate and hydrocyanic acid appear about equally effective in killing the red scale, molecule for molecule, methyl thiocyanate having the superior efficiency in obtaining a complete kill. Because of its lower molecular weight, however, hydrocyanic acid is superior on a weight basis. In some tests on citrus nursery stock, methyl thiocyanate proved inferior to hydrocyanic acid because of greater injury to the foliage.

"In regard to the variation of toxicity with chemical structure, it may be mentioned that in the case of the thiocyanates there was no evidence that the toxicity increased with the molecular weight, or boiling point; in fact, the lower members of the series seemed to be the more effective."

Earth pearls of citrus roots, J. R. WATSON (*Fla. State Hort. Soc. Proc., 47 (1934), pp. 55–57*).—Attention is called to a coccid, provisionally identified as *Margarodes rileyi*, that has been found infesting the roots of unthrifty citrus in groves at Waverly and from Lake Wales to near Fruitland Park, Fla., to a less extent of Bermuda grass, and in small numbers the roots of *Centaurea*. They are found only in sandy soil. Heavily infested trees have a yellow starved appearance and carry dead twigs and branches.

Some further observations on Margarodes in citrus groves, J. R. WATSON (*Fla. State Hort. Soc. Proc., 48 (1935), pp. 90, 91*).—These notes supplement the information (noted above) on this scale, found to infest the roots of citrus trees and a number of other plants, especially grasses.

Some tests of pyrethrum, derris, and nicotine mixtures against cabbage worms, H. C. HUCKETT (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 575–580*).—In work on Long Island, powdered derris root (4.5 percent rotenone, 16 to 18 percent total extractives) at strengths comparable to 4, 3, and 2 lb. of powder per 100 gal. of water gave a higher degree of mortality in the case of the imported cabbageworm than to larvae of the cabbage looper, and further, such mixtures were relatively ineffective to the zebra caterpillar. In the case of the cabbage looper the degree of effectiveness obtained at the highest derris strength was considered scarcely satisfactory.

"In tests with pyrethrum and so-called pyrethrins containing dust mixtures in contact applications for the larvae of the cabbage looper, at strengths of about 0.45, 0.27, and 0.18 percent pyrethrin content for mixtures containing ground pyrethrum flowers and of about 0.2 and 0.1 percent content for mixtures containing an impregnation with extract of pyrethrum flowers, the latter type of dust was the more effective.

"Nicotine sulfate-hydrated lime dusts of 3 and 4 percent nicotine content gave satisfactory results in a heavy contact application for the earlier instars of the zebra caterpillar; in contrast, a lighter application to older larvae of the cabbage looper was ineffective."

Notes and observations on the pistol case-bearer, E. GOULD (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 573–575*).—An outbreak of the pistol casebearer in a large commercial orchard near Ranson, W. Va., in 1927 is said to be the first of importance to be recorded in that State. Since that time there have been

outbreaks in a number of orchards throughout the Shenandoah-Cumberland fruit belt, these being generally distributed throughout the entire region. Thirty-six species of parasites have been reared from this host, 33 from larvae and 3 from the egg. Only 5 of these, namely, *Microbracon pygmaeus* Prov., *Eurydinota lividicorpus* Gir., *Habrocytus* n. sp., *Hemiteles tenellus* Say, and *Meteorus vulgaris* Cress., are normally common enough to be a significant factor in control. The nicotine-oil combination was found to be the most effective larvicide tested for the control of the casebearer. Summer oil used at the rate of 1 gal. per 100, with nicotine sulfate 1:800, is said to be as effective as, and cheaper than, the recommended nicotine-Penetrol combination. Recent work has shown that a 1 percent summer oil applied as an ovicide is very effective in controlling the casebearer. For best results, it is necessary that this spray be applied when the maximum number of eggs are present on the under surface of the leaves.

An experiment for the control of juniper webworm, Dichomeris (Ypsolophus) marginellus Fab., M. G. FARLEMAN (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 493, 494*).—Injury to juniper trees in a nursery, reported in September 1935, was found by the Michigan Experiment Station to be due to larvae of *D. marginellus*. Two plats were sprayed on September 4, (1) with nicotine sulfate (40 percent) 1:400, and (2) with Loro 1:400, both using a sulfated higher alcohol spreader at the rate of 6 oz. in 100 gal. Examination showed that the Loro plat required further treatment. As a safeguard, both plats were sprayed a second time, using nicotine sulfate with the same spreader and at the strength previously employed. In an examination made on September 25, the majority of the twigs, ranging from 3 to 6 linear in., possessed 3 to 8 larvae. Of the 725 larvae found in these samples, 694 had been killed. No spray injury to the juniper foliage was observed.

Further studies of larvicides to control fruit tree leaf roller, with special reference to lead arsenate and supplements, P. J. CHAPMAN and R. W. DEAN (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 561–570, figs. 2*).—The results of further work at the New York State Experiment Station (E. S. R., 73, p. 354) on the control of the fruit tree leaf roller are reported, the details being given at length in tables.

Nearly equal control efficiencies were obtained with a dormant-applied 6 percent oil spray functioning as an ovicide and the better lead arsenate or larvicidal treatments, if the damage attributable to the oil is disregarded. With the same qualifications, maximum efficiencies have been shown to result where both oil and arsenical were used. The dormant sprays applied in these tests caused a reduction in yield as a result of killing or weakening of the buds. This loss was pronounced where the 8 percent oil emulsion was used.

Lead arsenate sprays applied directly after and 7 days after blossoming contributed much more to whatever control was obtained than preblossom sprays in 1935. In one instance the control obtained with the two post-bloom sprays was essentially the same as when a schedule of two pre- and two post bloom sprays was applied. In relation to the development of the insect, these findings suggest that the spray coverage maintained directly after the hatching of the eggs was much more important in protecting the fruit in 1935 than that present immediately before and during hatching.

Lead arsenate used at the rate of 6 lb. per 100 gal. of water gave significantly higher efficiencies than the 3:100 rate in four of five comparisons. Differences in favor of the 6:100 rate ranged from 40.4 percent when combined with fish oil and wettable sulfur to no apparent difference in combination with 0.5 percent mineral oil and wettable sulfur.

Lime-sulfur-lead arsenate combinations were poorer by as much as 15 percent compared with mixtures of wettable sulfur and lead arsenate.

Results obtained with nicotine preparations were not as promising in 1935 as in 1934. Seasonal differences may be the explanation.

In spite of weather conditions which presumably hindered (in 1935) or favored (in 1934) the utilization of lead arsenate for the control of the fruit tree leaf roller, it was possible to obtain essentially the same results both years with comparable mixtures.

Pine-tip moths of southern Ohio, J. B. POLIVKA and J. S. HOUSER (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 494–497*).—In an insect survey of pine plantings made by the Ohio Experiment Station in 1934 and 1935, all species of pine studied, except white pine, either in native stands or in plants, were found infested by one or more of the three species of tip moths that occur in southern Ohio, namely, the Comstock tip moth *Rhyacionia comstockiana* Fern., the Nantucket tip moth *R. frustrana* Comst., and the Zimmerman tip moth *Pinipestis zimmermanni* Grt.

"With the exception of ponderosa pine, those species most seriously infested are those whose native habitat most closely approaches that of the area studied. There is a correlation between abundance of native pine, infestation of native pine, and infestation of plantings of pine species similar in susceptibility to native sorts. In some areas tip moths have caused significant damage both to native stands and to planted areas. The variation in infestation from one year to another by any one species of tip moth may be due to parasitism, but up to now there are no data on this point for southern Ohio."

Variations in codling moth injury in northwestern Arkansas, D. ISELY and H. H. SCHWARDT (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 473–476*).—Records kept by the Arkansas Experiment Station of codling moth injury in the northwestern part of the State from 1918 to 1935, inclusive, and spraying experiments for 11 of the 17 yr. are considered. The severity of infestation is grouped by years as follows:

"Years of very light infestation, when even poorly sprayed orchards were relatively free from worms—1919, 1922, and 1935. Light infestation, when 80 to 90 percent or more of the fruit was free from worms in well-sprayed orchards—1923, 1924, and 1928. Medium infestation, during which severe losses frequently occurred—1926, 1927, 1929, 1930, 1931, and 1934. Possibly 1926 belongs with this last group, and 1930 and 1931 with the following one. Heavy infestation, during which losses in well-cared-for orchards frequently approached 20 to 40 percent—1918, 1920. Most severe injury—1925, 1932, and 1933.

"Among the factors which have been responsible for this variation in abundance of the codling moth, the climatic conditions at the time of flight of moths of the overwintered brood appear to be most important. During the severe years, 1918, 1925, 1932, and 1933, the temperature during May and June was distinctly above normal. During the light years, 1919, 1923, 1924, 1928, and 1935, the temperature during this same period was below the mean. Similarly during years of heavy injury the rainfall was below the mean during the period of flight of moths of the overwintered brood, while during the light years for the same period it was above normal."

It was difficult to find any consistent relationship between the summer weather and codling moth abundance. The temperature hazard to the codling moth in summer seems more likely to be from temperatures that are excessively high rather than from those that are low. Other factors besides acquired resistance and temperature may have brought about a change in the codling moth problem, such as a change since 1918 in a large percentage of the acreage which was

in the moderately susceptible variety Ben Davis and the less susceptible Winesap to the very susceptible varieties Delicious, Stayman, and Golden Delicious.

Codling moth spraying experiments in Pennsylvania in 1935, H. N. WORTHLEY (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 527–532*).—Spraying work conducted by the Pennsylvania Experiment Station in the south-central part of the State, the details of which are given in six tables, indicated that the safest and most effective treatment for codling moth control consists of four first-brood cover sprays of lead arsenate at approximately 10-day intervals from early June to early July, the first two sprays containing fish oil and the last two Black Leaf 155 B or a similar but less injurious formula if one can be developed. For the few orchards where second-brood sprays may be necessary the omission of sulfur after the third week in June is recommended, as summer oil with nicotine sulfate or with Black Leaf 155 A appears to be the only safe and effective substitute for lead arsenate for second-brood codling moth control. Because of the expense of such a schedule, the importance of attempting to secure a high degree of control of the first brood during June is stressed.

Laboratory tests of phenothiazine against codling moth larvae, E. H. SIEGLER, F. MUNGER, and L. E. SMITH (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 532–537*).—In a further study of phenothiazine (E. S. R., 73, p. 808), laboratory work with codling moth larvae has shown that "the initial toxicity of pure phenothiazine is superior to that of lead arsenate. The reduction in the percentage of stings on fruit sprayed with this material is frequently striking. Commercial phenothiazine (55 percent phenothiazine), however, was less effective than lead arsenate, especially when the sprays had been subjected to normal weathering. The physical properties of phenothiazine are in general fairly satisfactory for insecticidal purposes and for an organic compound its cost is relatively low. However, the practicability of using this material as an insecticide for the codling moth can be determined only by adequate experiments under orchard conditions."

Tests of insecticidal efficiency of some contact sprays against codling moth eggs, W. S. HOUGH and R. N. JEFFERSON (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 537–541*).—The details of experiments in which ovicides were used against eggs of the codling moth at Winchester, Va., in 1934 and 1935 and at Blacksburg in 1935 appear in tables.

"Orthol K emulsion at the rate of 2, 3, and 4 qt. per 100 gal. were used alone and in combination with bordeaux mixture, and in each instance ovicidal efficiency was reduced by the bordeaux mixture, but when used at the rate of 4 qt. per 100 gal. the ovicidal efficiency was not reduced to a considerable degree. Oil in combination with bordeaux mixture in the tests of 1935 resulted in a relatively high percentage of control, except in the case of white oil dispersed with pine tar soap to which bordeaux mixture was then added. In this formula the run-off appeared to be excessive. Summer scalecide (a new preparation was used in 1935) failed to give satisfactory control; likewise, paraffin-wax emulsion, except when the undiluted stock emulsion, containing 20 percent wax, was used. A wetting agent (Aresket) at the rate of 0.1 percent by volume caused excessive run-off of all sprays in which it was used. At comparable oil dilutions certain vegetable oils were equal to or slightly more effective than refined petroleum oil as an ovicide in tests on codling moth eggs."

Inheritance of resistance to the hessian fly in the wheat crosses Dawson × Poso and Dawson × Big Club, W. B. CARTWRIGHT and G. A. WIEBE (*Jour. Agr. Res. [U. S.], 52 (1936), No. 9, pp. 691–695, fig. 1*).—Under the conditions of the experiment, conducted at Birds Landing, Calif., the Dawson parent

variety showed 0.4 percent of the plants infested with the hessian fly. For the other parent varieties, Poso and B 8 Club, the percen ages were 96.9 and 98.4, respectively. On the basis of the behavior of F_2 rows, both crosses indicated that inheritance of resistance to the hessian fly is controlled by two genetic factors. It was found that the fly was unable to complete its life cycle on resistant plants. With the knowledge gained, an attempt is being made to breed varieties of wheats for California that will possess resistance to infestation by the hessian fly.

Relative toxicity of some optically active and inactive rotenone derivatives to culicine mosquito larvae, D. E. FINK and H. L. HALLER (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 594–598, fig. 1*).—In the work reported "nearly full-grown culicine mosquito larvae, principally *Culex quinquefasciatus* Say, were used as test insects to compare the toxicity of rotenone, deguelin, optically active and inactive dihydrodeguelin, and optically active and inactive isorotenone, the chemical relationships of which are discussed. Optically active dihydrodeguelin and isorotenone were more toxic than the corresponding optically inactive forms. It is therefore probable that the hitherto unaccountable toxicity of derris extractives can be attributed partly to the optically active deguelin known to be present."

Dosage-mortality curve of pyrethrum sprays on the house fly (Musca domestica L.), D. HOYER, S. Z. VON SCHMIDT, and A. WEFD (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 598–600, fig. 1*).—The effect of pyrethrum sprays on the housefly is shown in table and chart form.

Notes on the apple maggot, P. GARMAN (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 542–544*).—The report of Allen and Fluke (E. S. R., 70, p. 509) showing that the apple maggot can be reared during the winter and the flies utilized for control experiments led to work by the author, who has successfully reared the flies in winter under laboratory conditions at the Connecticut [New Haven] Experiment Station. Lime, talc, and sulfur were found to have considerable repellent action toward oviposition. The adult fly was affected by cryolite almost but not quite as much as by lead arsenate.

A new Ecuadorian fleabeetle injuring crucifers (Coleoptera: Chrysomelidae), H. S. BARBER (*Jour. Wash. Acad. Sci., 26 (1936), No. 4, pp. 181, 182*).—Under the name *Disonycha camposi* n. sp., a description is given of a flea beetle said to damage cruciferous plants at Guayaquil, Ecuador.

Barium carbonate for the bean beetle, L. M. PEARS (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 584, 585*).—Barium carbonate, which has been very extensively marketed under the trade name Baricide as an insecticide for the control of the Mexican bean beetle, was tested during the seasons of 1934 and 1935 in the laboratory and field at Morgantown and at Kearneysville, W. Va.

In laboratory tests it was found to be rather slowly fatal to Mexican bean beetles and their larvae and toxic to blister beetles and to potato beetles, with uncertain results on some flea beetles and nymphs of grasshoppers. Several species of caterpillars ate the poison in laboratory tests without apparent effect; field tests against cabbage butterfly larvae and cabbage loopers likewise showed no protection to the infested plants; fall webworms were resistant, and no other caterpillars tested showed any definite ill effects. It was found that 1 lb. to the gallon gives the best control but that 0.5 lb. or even 0.25 lb. give nearly as good control commercially.

It appears that Baricide does not equal the best of the standard materials such as magnesium arsenate and some of the fluosilicates, although satisfactory control in moderate infestations at least may be secured from its use. Further, Baricide may be recommended only where cost of material and amount

of labor required are not important factors and where poisonous residues are particularly objectionable. Since such conditions obtain with a great number of growers of beans, it appears that there may be a definite place for this material, with all its limitations, as an insecticide for bean beetle control.

Effects of some inorganic salts on development and reproduction of the bean weevil (Acanthoscelides obtectus), R. J. BUSHNELL (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 509–514*).—Following a brief reference to the literature, experiments which have shown an inhibiting influence by potassium chloride and sodium sulfate on the oviposition of the bean weevil when the ovipositing females have been reared in normal beans are reported. Other salts that were used appeared to have slight or no influence on oviposition. Ferric sulfate in sufficient amounts increased the duration of the larval stage of the bean weevil. Sodium chloride, sodium nitrate, and potassium chloride in the larger quantities affects the development of the bean weevil by increasing the duration of the larval, prepupal, and pupal stages. This effect is apparent whether the beetles are reared at 25° or 30° C., but the differences in developmental rates are greater at the lower temperature. The effect of the sodium salts on the weights of bean weevils appears to depend upon whether they contain monovalent or bivalent anions. It was shown that those salts which cause a decrease in weights of the young adult bean weevils also cause a decrease in the number of offspring obtained.

Dust treatments for protecting beans from the bean weevil, H. O. DEAY and J. M. AMOS (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 498–501*).—The results of experiments set up in 1933 are reported in detail in a table.

"Untreated navy beans were 54 percent infested by bean weevils when exposed to their attack for 6 mo. Anderson clay, Dawson clay, Dutox, and dusting talc at all dilutions used gave perfect or nearly perfect protection to navy beans from infestation by the bean weevil. Hydrated lime was a little less efficient than the foregoing materials but still very effective at all dilutions used. Coal ashes prevented infestation at dilutions of 1:2 and 1:4 and allowed less than 0.5 percent infestation at dilutions of 1:10 and 1:25. Wood ashes gave perfect protection at dilutions of 1:2 but allowed an infestation of 1 percent or more at greater dilutions. Flour was ineffective at dilutions of greater than 1:2. It gave perfect protection at dilution of 1:1 in preliminary tests. The protection afforded by the nonpoisonous dusts, especially at high dilutions, is definitely correlated with the adhesivity of the material. None of the materials used affected the cooking quality or taste of the beans, but materials that adhered well and wrinkled the seed coat were much harder to remove by washing. None of the materials used affected germination of the beans."

Partial second brood of plum curculio in Virginia, W. J. SCHOENE (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 571–573*).—It is concluded from a study at the Virginia Experiment Station of the life history of the plum curculio and other data that Virginia is on the border line between the one-brooded and the two-brooded areas, and that in seasons that are favorable to the curculio a partial second brood occurs.

The apple flea weevil, J. S. HOUSER and R. B. NEISWANDER (*Ohio State Hort. Soc. Proc., 69 (1936), pp. 10–15*).—This contribution from the Ohio Experiment Station reports upon the present status of the apple flea weevil, a bulletin on which, by the author, has been noted (E. S. R., 51, p. 257). The pest has been found to be attacked by 22 species of parasites and a fungus disease, which occasionally become so abundant that an infestation may be nearly eliminated.

Control work with insecticides in 1934 and 1935 has shown fluorine to be peculiarly and particularly toxic to insects of the apple flea weevil group. The application (1) of Dutox, a patented barium fluosilicate product, or (2) of Kalo Spray, a specially prepared natural cryolite, at the rate of 5 lb., with flotation sulfur 8 lb., Goulac 3 oz., and water 100 gal. during the pink and prepink periods is recommended.

The use of flotation sulfur in the preblossom spray, fluorine being incompatible with lime-sulfur, prevented scab damage as effectively as lime-sulfur used at the conventional strength.

The apple flea weevil, J. S. HOUSER and R. B. NEISWANDER (*Midwest Fruitman, 9 (1936), No. 10–11, pp. 5, 9, 10*).—A practical account based on the above.

A new and effective control for apple flea weevil, J. S. HOUSER and R. B. NEISWANDER (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 481, 482*).—In this further contribution the efficiency of fluorine in combating the pest is emphasized.

"A comprehensive series of spray plats was executed in 1934 at Medina, Ohio, and repeated with slight modifications in 1935 at Medina and at Jackson, Ohio. In all three series, fluorine was outstandingly successful to the extent that in plats so treated flea weevil damage was reduced to a point considerably below that of significant injury. The formula used was Dutox or Kalo spray 5 lb., flotation sulfur 8 lb., Goulac 3 oz., [and] water 100 gal. One application was made during the pre-pink period and another when the apple buds were in the full-pink stage. In each instance the under side as well as the upper side of the foliage was covered, with particular attention given to the inner portions of the tree. Plats sprayed with Kalo spray were slightly less damaged by flea weevil than were the Dutox plats."

Quantitative demonstration of the presence of spores of Bacillus larvae in honey contaminated by contact with American foulbrood, A. P. STURTEVANT (*Jour. Agr. Res. [U. S.], 52 (1936), No. 9, pp. 697–704*).—In continuation of earlier work (E. S. R., 68, p. 360), in which it was found to be possible to demonstrate the presence of spores of *B. larvae*, the cause of American foulbrood, in samples of commercial honey that had had contact with American foulbrood in the course of their production or preparation for the market, the author has developed a quantitative method for determining the approximate number of spores per cubic centimeter in such honey. The method, which is similar to that employed by Breed and Brew at the New York State Experiment Station (E. S. R., 35, p. 70) for counting bacteria in stained smears of milk, is described, and formulas are given for calculating the number of spores per cubic centimeter in honey. Data obtained, using samples of honey of known spore contents, are given with the formula for calculating the mean spore count per field that theoretically should be recovered from such samples, as derived from actual spore counts per field of stained sediments from honey. A statistical analysis of the data indicates that the method used is sufficiently accurate for determining the spore content of unknown honeys. The formulas for calculating the data, with permissible limits of error, are also given.

Distribution of the Argentine ant in the United States and suggestions for its control or eradication, M. R. SMITH (*U. S. Dept. Agr. Circ. 387 (1936), pp. 40, figs. 24*).—This contribution deals with the distribution and abundance of the Argentine ant, control and eradication work in Mississippi, and the method recommended for its control or eradication.

The pest has been found in all types of soil and at elevations ranging from approximately sea level to nearly 4,000 ft. "They seem to be affected by strong winds and by moisture conditions in the soil. Although tropical insects, they can withstand more cold than most of our native ants. It is estimated that

the Argentine ant occurs over an area of at least 4,000 sq. miles in the United States. California and Louisiana are the most heavily infested States, and infestations also occur in Mississippi, Alabama, Georgia, Texas, South Carolina, Arkansas, North Carolina, Florida, Maryland, Tennessee, Arizona, Missouri, and Illinois (States listed in order of decreasing size of infested area). The size of the infestations varies from a single colony to areas containing several hundred square miles. Although as yet the ants are sporadically distributed over the States mentioned, except in Missouri, Maryland, and Illinois, where the infestations are of the indoor type, there is nothing to prevent them from occupying the entire area within their present boundaries and also from spreading to additional territory.

"Efforts to control and eradicate the Argentine ant in Mississippi by poisoning campaigns have resulted in freeing 39 out of 245 infested localities and reducing the infestations in nearly all the others. The method used in Mississippi is therefore described in some detail. . . . The ants can be controlled by one thorough campaign, and by repeating the campaign each fall it is possible to eradicate them in from 2 to 5 yr. The method consists, in brief, in making careful surveys of infested areas and then placing cups of sirup containing sodium arsenite at proper intervals throughout these areas. Where eradication is attempted, supplementary measures, such as burning and oiling colonies, expedite the work, although these should not be resorted to until the numbers have been greatly reduced. The cost of eradicating ants should not be more than 3 ct. per cup of poison or $3 to $6 per block."

A list is given of 18 references to the literature.

The female sex of the genus Photomorphus (Mutillidae), C. E. MICKEL (*Ann. Ent. Soc. Amer., 27 (1934), No. 4, pp. 610–613; abs. in Minnesota Sta. Rpt. 1935, p. 32*).—A description is given of the male mutillid wasp, of which the female was described by Cockerell in 1895 as *Sphaerophthalma myrmicoides*. The species is assigned to the genus *Photomorphus*.

Problem of European red mite on prunes in western New York, T. W. REED (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 546–550, figs. 4*).—In control work at the New York State Experiment Station with the European red mite, probably the most serious pest attacking prunes in western New York, the dormant oil treatment was found helpful in checking the pest, although in a hot, dry season it may increase to serious numbers. Lime-sulfur is effective in killing the mites, but the burning effect on the foliage is often too severe and may reduce the yield. The summer oils applied either at the shuck-fall spray or later in the summer killed not only the mites but prevented the eggs from hatching. However, when applied in July or August the summer oils, although not actually injuring the fruit, do produce spotting, and this detracts from its appearance at picking time. When summer oil was applied with bordeaux at the shuck-fall stage, no spotting was noticeable and the mites did not become numerous. They had increased in numbers by September, but since the fruit is usually picked before September 15 and since the foliage at this season is tough and rather dry, the mites produced no noticeable injury. It was observed in various plantings that the mites were less numerous on those trees on which no sulfur had been used than on those which had been treated with sulfur sprays or dusts.

The data suggest that the more vigorous a planting the less is the harmful effect of mite population or lime-sulfur. In fact it seems logical to assume that proper fertilization and care of the planting are the first and most important steps in a European red mite control program.

Derris insecticides.—VI, Summer control of European red mite on apple with derris and neutral wetting agents, R. E. HEAL (*Jour. Econ. Ent., 29*

(*1936*), *No. 3, pp. 550–556*).—In continuation of this study at the New Jersey Experiment Stations (E. S. R., 73, p. 647), field tests were carried out on the summer control of the European red mite on apple trees the foliage of which retained sulfur and arsenical residues. "Sprays containing derris in various proportions in combination with different wetting agents were used. Derris was supplied in three forms, a dust of 1 percent rotenone content, a dust of 0.75 percent rotenone content, and a finely ground root of 4 percent rotenone content. Aresket, Areskap, and Aresklene, skim milk, and soap were used as wetting agents. The combination which was shown to be most satisfactory consisted of 1.25 to 2 lb. of derris root (4 percent rotenone) and 10 oz. of Aresket or Areskap to 100 gal. of spray. The outstanding feature of this spray, beyond its toxicity to the pest, was its compatibility with sulfur and lead arsenate deposits on the foliage, the presence of the former precluding the use of any oil spray, and the presence of the latter estopping the use of any spray containing soap. Two applications spaced at a period of from 1 to 2 weeks apart were necessary to effect control. The length of period between applications was dependent on the rate of development of the immature stages of the mite. Thorough application was found to be essential for the effective use of this spray.

"Derris dust of 1 percent rotenone content was of no value in the control of this pest when applied as a dust."

ANIMAL PRODUCTION

[**Investigations with livestock in Florida**] (*Florida Sta. Rpt. 1935, pp. 51, 52, 53, 54, 56–58, 72, 129, 134–136, 137, 138, 149–152*).—The results obtained in tests with beef cattle are reported on grading up native cattle by the use of purebred bulls, by A. L. Shealy; the efficiency of the trench silo for preservation of forage crops as measured by chemical means and by the utilization of the nutrients of the silage by cattle, by Shealy, W. M. Neal, and R. B. Becker; at the Everglades Substation mineral supplements for young calves and cut sugarcane for range cattle, both by R. W. Kidder; at the North Florida Substation the feeding value of sorghum silage, peanut hay, and cottonseed hulls as roughages in fattening steers, by L. O. Gratz and R. M. Crown; and at the West Central Florida Substation the milk production of Red Polled cows, birth weight of purebred and grade Red Polled calves, comparison of digester tankage and cottonseed meal for wintering mature cows and yearling heifers, and the mineral intake of dual-purpose and native cattle.

Swine studies yielded results on a comparison of corn, sweetpotatoes, and Spanish peanuts with dry lot feeding for pork production, and fattening fall pigs for spring market on runner peanuts and sweetpotatoes, both by W. W. Henley; and at the North Florida Substation a comparison of gains made by swine on corn, corn and tankage, corn and cowpeas, corn and peanuts, and Spanish peanuts, by Gratz and Crown.

Studies on the adaptability of Columbia sheep to Florida conditions are reported from the North Florida Substation, by Gratz and Crown.

In tests with poultry, information was obtained on the effect of feeding crotalaria seed to chickens and other birds, by M. W. Emmel; a comparative study of corn and liquid milk v. a grain and mash ration in feeding for egg production, a comparative study of the value of meat scrap, fish meal, and milk solids as sources of protein for egg production, and lights v. no lights for egg production, all by N. R. Mehrhof and E. F. Stanton; the physical properties of eggs from hens on experimental diets; the storage of eggs; and at the West Central Florida Substation on confinement v. range rearing of chicks, the

importance of range rotation in poultry production, egg production and mortality from pullets reared under confinement v. range conditions, the comparative value of milk solids, ground peanut kernels, meat meal, and fish meal in fattening broilers and fryers, and all-night lights v. no lights on Single Comb White Leghorn hens, all by Mehrhof, Emmel, and W. F. Ward.

[Investigations with livestock in Idaho], H. P. MAGNUSON, C. W. HICKMAN, C. E. LAMPMAN, J. TORVS, and R. F. JOHNSON (*Idaho Sta. Bul. 220 (1936), pp. 7, 8, 20–22, 43–45, 50, 51, 53–56*).—Results obtained in experiments with cattle are reported on phosphorus deficiencies in cattle in various parts of the State, the carotene content of pasture grasses, the negative effect of phosphorus supplements in steer fattening rations, and at the Caldwell Substation a comparison of light and heavy silage feeding for fattening steers, feeding steers with and without minerals, feeding yearling steers on pasture, and the carrying capacity of different pasture grasses.

Studies with swine produced data on bone inequalities in the foot development of swine, and the inheritance of inverted nipples.

In tests with sheep information was reported on the negative effects of phosphorus in lamb fattening rations at the Caldwell and Aberdeen Substations, and a comparison of light and heavy silage feeding for fattening lambs at the Caldwell Substation.

Poultry tests led to information on the high vitamin A requirements of laying hens, the need of animal protein supplements in rations containing peas, and confined v. range rearing of birds.

[Investigations with livestock in Michigan], G. A. BROWN, H. R. HUNT, and C. G. CARD (*Michigan Sta. Rpt. 1935, pp. 159–161, 230, 231, 238, 239*).—Studies with livestock yielded results on limited v. liberal rations for the development of draft colts, finishing steer and heifer calves, and silage v. shocked corn for beef cattle.

In swine tests information was obtained on the allowance of skim milk for growing and fattening pigs, alfalfa meal as a protein supplement for brood sows, and corn and barley for pigs on pasture.

Sheep studies produced results on winter rations for breeding ewes, methods of self-feeding and amounts of roughage desirable for fattening lambs, and cross-breeding and selection for the improvement of wool and other characters.

In poultry work progress was made in a comparison of different pasture crops for growing poultry, the effect of artificial heat on egg production of pullets during the winter months, and a comparison of electric and coal brooders in the production of winter broilers.

[Investigations with livestock in Montana] (*Montana Sta. Rpt. 1934, pp. 49, 50–52, 66–68, 72–77*).—Results obtained in tests with beef cattle are reported on the value of adding cottonseed cake to a barley and alfalfa ration, and of substituting dried beet pulp for part of the barley in rations for fattening calves; at the Northern Montana Substation on the use of locally grown feeds for winter maintenance of mature cows, the disadvantage of feeding breeding cows for heavy gains during the winter, feeding wheat and barley to finishing yearling steers, full v. light winter rations in developing heifers, and effect of type of sire on birth and mature weight of heifers. At the U. S. Range Livestock Experiment Station progress was made in the development of economical rations for wintering cattle on the range and in the feed lot.

In sheep studies, information was obtained on summering ewes and lambs on the forest, dried beet pulp and alfalfa for wintering breeding ewes, a limited roughage ration for breeding ewes, and limited and full feeding of ewe lambs. At the U. S. Range Livestock Experiment Station a comparison was made of cot-

tonseed cake and corn as supplements for wintering ewes on the range, and data obtained on methods of wintering ewe lambs.

Swine tests at the U. S. Range Livestock Experiment Station were concerned with the production of quality bacon from hogs raised on irrigated alfalfa pasture and cereal grains.

Turkey studies at the U. S. Range Livestock Experiment Station produced results on the protein, mineral, and vitamin requirements of turkeys, growing and fattening turkeys, and the feed requirements of breeding turkeys.

[Experiments with livestock in South Dakota], J. W. WILSON, K. W. FRANKE, and W. E. POLEY (*South Dakota Sta. Rpt. 1935, pp. 14, 15, 17, 18, 19, 45, 46*).—Information obtained in tests with beef cattle are reported on the substitution of tankage for linseed oil meal in rations for calves, the value of Russian-thistles and Sudan grass as roughages, and the value of tankage as a supplement to corn and alfalfa hay for baby beef production.

In the swine tests results were obtained in fattening summer pigs on South Dakota grains, Russian-thistle and pigweed as pastures for pigs, and attempts to feed soybeans with corn to avoid soft pork.

Poultry studies yielded evidence on the values of white corn and milk in growing turkeys, turkey egg hatchability, and the value of oats and millet in growing and laying rations for pullets.

The effect of retarded growth upon the sexual development of rats, S. A. ASDELL and M. F. CROWELL (*Jour. Nutr., 10 (1935), No. 1, pp. 13–24*).—This study involved the use of three groups of rats on different planes of nutrition, one group receiving an optimum ration, the second group kept at an average weight of 40 g, and the third group at 80 g. When signs of failure were observed both restricted groups were allowed to gain 10 g in weight. Throughout the trial energy intake was the only limiting factor in the diet.

It was observed that the age at opening of the vagina increased while weight at opening decreased with severity of diet restriction. Evidently age is a more important consideration than weight in this respect. The increased severity of treatment increased the age and weight interval between the vaginal opening and the occurrence of first oestrum, these two events becoming entirely dissociated with severe restriction. Cornified vaginal smears were common in the normal rats but never observed in the restricted groups. The cornified rats weighed less than those with regular cycles, and the latter in turn weighed less than anoestrous rats. When energy above maintenance was supplied, both growth and sexual activity occurred until increased growth increased maintenance to the level of energy intake, then both growth and sexual activity ceased. Occurrence of an oestrous smear is considered a delicate indication of increased energy supply. A sex deformity observed in deprived males and the mode of action of the anterior hypophysis are each discussed briefly.

The role of calcium and phosphorus in determining reproductive success, W. M. COX, JR., and M. IMBODEN (*Jour. Nutr., 11 (1936), No. 2, pp. 147–176, figs. 8*).—This extensive investigation involved the use of 145 female rats, in 20 groups of 5 each, which had been studied for 10 consecutive reproductive cycles while receiving diets of purified foodstuffs containing varying levels and ratios of calcium and phosphorus.

The results are evaluated on the basis of the average weight of the young at 21 days, the percentage of ash in the young, and the change in weight of the mother throughout the cycle. A calcium-phosphorus ratio of 1 at a calcium level of 0.49 percent was adjudged the ideal level and ratio for successful gestation and lactation. Excessive mineral intake produced poor results regardless of ratio, while phosphorus in excess was better tolerated than excess calcium.

Factors affecting the carotene content of alfalfa hay and meal, H. R. GUILBERT (*Jour. Nutr., 10 (1935), No. 1, pp. 45–62, fig. 1*).—In this study at the California Experiment Station in cooperation with the U. S. Department of Agriculture, extensive tests were conducted to measure the degree of carotene destruction in alfalfa under various methods of handling.

Little or no loss occurred in vacuum drying. Very rapid losses occurred when fresh alfalfa was sun-dried or when dried alfalfa was exposed to either direct sunlight or sunlight filtered through ordinary glass. Autoclaving resulted in significant losses, and the destruction of enzymes by this process reduced but did not eliminate further loss when the hay was subsequently sun-dried. Enzyme action was found to be an important factor in carotene losses and under unfavorable drying conditions may cause extensive destruction. Temperature proved a major factor in determining the amount of carotene loss during storage. During 8 weeks' storage at −5° to 5° C. no loss was observed, while at 20° to 30° 30 percent losses occurred, and 9 days' storage at 60° and 80° gave 62 and 87 percent losses, respectively. Large losses were also noted in both dehydrated and sun-cured meal in a warehouse during hot weather.

It is pointed out that no broad generalities regarding the relative values, based on curing methods, should be made without consideration of the carotene content of the original hay and unless effective means are employed to prevent deterioration in storage.

The comparative digestibility of artificially dried pasture herbage by sheep and rabbits, C. J. WATSON and W. GODDEN (*Empire Jour. Expt. Agr., 3 (1935), No. 12, pp. 346–350*).—The digestibility of 5-week-old artificially dried herbage, consisting of mixed grasses and clover, was determined by digestion trials with four male rabbits and two wether sheep. The coefficients of digestibility for nitrogen, ether extract, crude fiber, and nitrogen-free extract were 61.5, 25.8, 26, and 55.9, respectively, for the rabbits, and 76.7, 51.8, 74.5, and 81.4, respectively, for the sheep.

Lake vegetation as a possible source of forage, R. A. GORTNER (*Science, 80 (1934), No. 2084, pp. 531–533; abs. in Minnesota Sta. Rpt. 1935, p. 34*).—In this article from the Minnesota Experiment Station the author shows the dry matter, ash, crude protein, and crude fiber content and indicates the feeding value of 16 different kinds of lake water vegetation from representative Minnesota lakes. These forages were generally characterized by a high protein, high lime, and low fiber content.

Commercial feeding stuffs, L. S. WALKER and E. F. BOYCE (*Vermont Sta. Bul. 404 (1936), pp. 46*).—This is the usual report of the analyses for protein, fat, and fiber of 2,343 samples of feeding stuffs collected for official inspection during December 1935 (E. S. R., 74, p. 678).

Judging the age of sheep by their teeth (*Montana Sta. Circ. 149 (1936), pp. 4, figs. 6*).—This study covers the examination of the teeth of 2,300 Rambouillet sheep of known age, all of good quality, but not especially fed or cared for. Diagrams are presented showing the variations in stage of development of teeth at different ages with the percentage of each age group falling in the various classes.

It is evident that there is considerable overlapping of the stage of teeth development from one age group to the next, so that in a rather large percentage of cases it is impossible to determine the correct age. This is illustrated by the fact that the teeth of 57 percent of the 2-year-olds and 28 percent of the 3-year-olds appeared alike.

The effect of the plane of nutrition of ewes upon their wool, lamb, and milk production, M. G. SNELL (*Louisiana Sta. Bul. 269 (1936), pp. 23, figs. 9*).—

In an attempt to determine the cause of excessive shedding of wool by sheep on cut-over range areas in Louisiana, demonstratively not due to scab, a 3-yr. experiment was conducted with four lots of 10 ewes each, fed in dry lot. Lot 1 ewes received a full feed (60 parts hay, 40 parts grain) continuously; lot 2 ewes were fed the same as lot 1 ewes for 8 mo. but for 4 mo. (representing the winter range condition) they were fed only one-third as much as those in lot 1; lot 3 ewes received two-thirds as much; and lot 4 ewes one-third as much as did the lot 1 group.

Lot 1 ewes showed greater gains in weight, produced more wool with fiber of greater length and diameter and less crimp, gave birth to more lambs, and produced more milk daily than any of the other lots. No shedding of wool occurred in this group.

Lots 2, 3, and 4 gave successively poorer results in each of these respects, with each group showing a tendency to shed. All of the original ewes in group 4 died before the end of the 3-yr. period.

There was little difference in birth weight or weight at 120 days of lambs from groups 1, 2, and 3, while lambs from group 4 were significantly smaller at birth and at 120 days. The low plane of nutrition in the experiment did not increase the ability of the ewes to digest feed.

Dry beet pulp, wet pulp, and dried molasses pulp, for fattening lambs, W. F. DICKSON and D. HANSEN (*Natl. Wool Grower, 26 (1936), No. 1, pp. 27, 28*).—The results from trials with 10 lots of 30 lambs each, fed over a 71-day fattening period, are reported by the Montana Experiment Station.

The addition of either wet or dried beet pulp to rations of oats and alfalfa or barley and alfalfa increased the rate and decreased the cost of gains. The dried pulp produced faster and cheaper gains than wet pulp in the oat-alfalfa ration, while in the barley-alfalfa ration dried pulp produced faster gains but at a slightly higher cost than wet pulp. A ration of barley, cottonseed cake, wet beet pulp, and oat straw produced both faster and cheaper gains than when dried pulp replaced the oat straw, the former giving the most economical gains of any ration tested. It is also noted that monocalcium phosphate failed to equal cottonseed meal as a supplement to a barley, alfalfa, and wet pulp ration. There was an average death loss of 5 percent with losses occurring in 8 of the 10 lots. This is higher than had been experienced during the last few years.

Self or hand-feeding for fattening lambs, F. BARNUM and W. F. DICKSON (*Natl. Wool Grower, 26 (1936), No. 4, p. 26*).—In this single trial at the Montana Experiment Station the data indicate that the group of self-fed lambs ate more feed per day, made more rapid and economical gains, were better finished, and dressed heavier than hand-fed lambs. While the heavier lambs in both groups gained faster than the lighter lambs, self-feeding favored the light lambs more than the heavy lambs.

The effect of age upon the weaning weight of range lambs, W. F. DICKSON and F. BARNUM (*Natl. Wool Grower, 26 (1936), No. 3, pp. 22, 23*).—The Montana Experiment Station has made a study of the weights of 2,130 Rambouillet lambs at weaning time covering a 3-yr. period.

It is noted that (1) single lambs weighed about 10 lb. heavier than twin lambs of the same age, (2) the oldest single lambs (from 160 to 169 days) averaged 17.5 lb. heavier and the oldest twin lambs 18.8 lb. heavier than the youngest (from 100 to 109 days) respective groups, and (3) the weight trends of the different age groups indicate that twin lambs were gaining faster than single lambs of the same age at weaning time. The management of flock at breeding time in order to obtain most favorable lambing is briefly discussed.

[Investigations with poultry in New Jersey] (*New Jersey Stas. Rpt. 1935, pp. 4, 5, 7, 78–81*).—Data obtained in experiments with poultry are reported on the vitamin A requirements of the chicken, the role of tryptophane in the nutrition of the chicken, methods of measuring egg size to serve as a basis for the selection of future breeding stock, the size of eggs produced during the hatching season, mortality rates in egg-laying contests between 1916 and 1933, and production records of birds in individual cages.

A note on the structure of egg white, P. J. SCHAIBLE, J. M. MOORE, and J. A. DAVIDSON (*U. S. Egg and Poultry Mag., 41 (1935), No. 12, pp. 38, 39, figs. 2*).—This brief report from the Michigan Experiment Station describes a simple method for observing the structure of egg white. The authors conclude "it is evident that the firm white is of laminated structure, composed of concentric layers containing mucin fibers."

A method of measuring the strength of the yolk membrane, S. S. MUNRO and G. ROBERTSON (*U. S. Egg and Poultry Mag., 41 (1935), No. 12, pp. 48, 50, fig. 1*).—A technic is described for measuring the breaking strength of the vitelline membranes in terms of millimeters of mercury in a vertical column. The average breaking strength of the membranes of 557 fresh eggs was 27.05 mm of mercury.

Factors modifying egg production with special reference to seasonal changes, E. O. WHETHAM (*Jour. Agr. Sci. [England], 23 (1933), No. 3, pp. 383–418, figs. 8*).—Data on seasonal variations in egg production are presented for different latitudes and correlated with different amounts and quality of light. It is considered that the influence of light is due to its action on the anterior lobe of the hypophysis, stimulating the production of the hormone. Hens with low levels of production were most affected by variations in the light.

The effect of variation in the calcium-to-phosphorus ratio on the utilization of nitrogen, calcium, and phosphorus by the growing chick, C. W. ACKERSON, M. J. BLISH, and F. E. MUSSEHL (*Nebraska Sta. Res. Bul. 83 (1936), pp. 11*).—In this study three groups, totaling 123 chicks, were fed accurately known amounts of rations (hand-fed as pellets) containing varying percentages of calcium, with liberal provision of the antirachitic factor so that conditions for assimilation and deposition were favorable. The percentage retention of nitrogen, calcium, and phosphorus was determined by comparative slaughter tests, comparison being made between newly hatched chicks and chicks which had been fed for several weeks.

About 37 percent of the ingested nitrogen and 28 percent of the phosphorus was retained in each of the three lots, while the percentage of calcium retention amounted to 35, 24, and 13 on the 0.9, 1.5, and 2.3 percent calcium rations, respectively. No significant change in the percentage composition of the chicks or the gains made by them was noted.

The amino acid content of eggs and chicks: Relation to diet and to incidence of chondrodystrophy, A. R. PATTON and L. S. PALMER (*Jour. Nutr., 11 (1936), No. 2, pp. 129–134*).—This investigation from the Minnesota Experiment Station reports significant differences in the glycine content of normal and chondrodystrophic chick embryos. Only slight variations occurred in the content of the other amino acids determined.

Eggs from hens fed an optimum ration and glycine-deficient rations showed no significant differences in the amino acid content of the egg proteins. Feeding glycine to hens in moderate amounts did not affect the glycine content of the eggs, while larger doses proved toxic. It is noted that incubated eggs contained more glycine than fresh eggs, indicating its synthesis during embryonic development.

The vitamin A reserve of embryo and baby chicks, A. D. HOLMES, F. TRIPP, and P. A. CAMPBELL (*Jour. Nutr., 11 (1936), No. 2, pp. 119–128, figs. 2*).—Data are presented on the vitamin A reserve of embryo and baby chicks determined by assaying the livers by the antimony trichloride colorimetric method. The unabsorbed egg yolk was also assayed.

For groups of eighteenth-day embryos, 6-hour old chicks, and 24-hour-old chicks the livers weighed 0.51, 0.89, and 1.1 g and contained 7, 12, and 19 blue units of vitamin A, respectively, while the vitamin A content of the unabsorbed yolk of these groups was 80, 58, and 44 blue units, respectively. The large store of vitamin A in the yolk undoubtedly influenced the rapid increase in the vitamin A content of the livers of chicks during the first few days after hatching.

Growth promoting effect of flavine on the chick, S. LEPKOVSKY and T. H. JUKES (*Science, 82 (1935), No. 2127, p. 326*).—A brief report is made confirming the conclusions of Elvehjem and Koehn (E. S. R., 73, p. 277) that flavine is powerless to prevent a pellagra-like syndrome in chicks caused by feeding a heated basal diet. The syndrome was prevented by the filtrate from liver extract after the flavines were removed.

When an unheated diet of the same composition was fed, slow growth occurred and growth was markedly accelerated by the addition to the diet of the fuller's earth adsorbate containing the flavine. It is concluded that liver extract contained two water-soluble factors which promote growth in chicks and that both factors are distinct from vitamin B (B_1).

The effect of feeding deaminized versus untreated cod liver oils on growth, egg production, and mortality of poultry, H. S. GUTTERIDGE (*Canada Dept. Agr. Pub. 475 (1935), pp. 29, fig. 1*).—The six samples of cod-liver oil and one sample of pilchard oil analyzed contained measurable quantities of nitrogenous material, ranging from 0.0003 percent in purified medicinal cod-liver oil to 0.031 percent in sun-rendered cod-liver oil, with an observed tendency for the oils high in nitrogenous material to also be high in free fatty acids. The removal of these nitrogenous fractions by chemical processes resulted in greater growth of young chicks, particularly cockerels, and also in more efficient use of the feed for egg production and maintenance and gain in body weight during the first laying year. It is concluded that oils produced under such conditions as to contain relatively high amounts of these nitrogenous fractions should not be used for poultry feeding purposes.

The effects of varying amounts of animal protein fed to White Leghorn pullets.—II, Factors correlated with egg-size and number of eggs, C. C. RHODES, L. H. BARTEL, and P. E. F. JOOSTE (*Empire Jour. Expt. Agr., 3 (1935), No. 12, pp. 313–319*).—By further summary of the data presented in part 1 of this study (E. S. R., 74, p. 834), the existing correlation between various characteristics of a pullet and the eggs she lays has been determined.

Egg weight was significantly correlated with average monthly body weight for all groups, with maximum body weight in the medium and high protein groups and with average body weight only in the medium protein group.

Annual egg production was highly correlated with winter (4 mo.) production and was negatively correlated with days out of production.

Oats for chickens, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul. 181 (1936), pp. 95–98*).—Continuing these studies (E. S. R., 63, p. 862), it was found that oats rations regardless of the form of oats fed or the method of feeding were decidedly superior to yellow corn rations without oats for egg production. Germinated oats gave good hatchability of eggs. Hulled oats were slightly better than other forms of oats from the standpoint of egg production and feed consumption. There was no evidence to support the conten-

tion that corn was superior to oats for the maintenance of body weight of layers. As much as 40 percent of oats could be fed without ill effects on the birds.

Since employing the free-choice system of feeding whole oats, troubles with feather picking, cannibalism, and pick-outs have largely disappeared, even where chicks or laying pullets were subjected to very severe conditions of confinement.

The oats could be fed in a variety of ways, but the inclusion of a large amount in a yellow corn ration led to a deficiency of vitamin A. This deficiency could be corrected by providing other sources of this vitamin, such as cod-liver oil or succulent green feed.

The management of laying hens in cages, W. C. THOMPSON (*U. S. Egg and Poultry Mag., 42 (1936), No. 1, pp. 24–27, fig. 1*).—In a preliminary study at the New Jersey Experiment Stations, 108 White Leghorn pullets were placed in individual wire cages on November 1 and kept on trial under close confinement for 1 yr. The pullets averaged 147.76 eggs per bird and returned a profit over feed cost of $2.77 each. No unusual conditions were encountered which could be attributed to the cage management. The greatest disadvantage was the increased initial cost for cage installation, but this was partially offset by the larger number of birds housed per unit of floor space and the saving in cost of labor and litter.

Wheat gray shorts for the prevention of slipped tendons in battery brooder chicks, R. M. SHERWOOD and J. R. COUCH (*Texas Sta. Bul. 525 (1936), pp. 25*).—A series of four studies is reported in which White Leghorn chicks were fed in battery brooders on various experimental rations. Data are presented on the frequency of slipped tendon, the rate of gain in live weight, and the feed requirement per unit of gain for each group.

The substitution of 20 percent of wheat gray shorts for a like amount of ground corn or ground kafir produced more rapid gains and fewer slipped tendons and required less fed to produce a unit of gain than did rations not containing the shorts. Rations containing 30 percent produced more rapid gains but required more feed per unit of gain than the rations containing 20 percent shorts. Rations containing wheat gray shorts milled from hard wheat produced fewer slipped tendons and more rapid gain, but required more feed per unit of gain than a ration containing soft wheat shorts. In three rations with different calcium-phosphorus levels with and without shorts, the presence of shorts had a greater effect on gain in weight, prevention of slipped tendons, and feed required per unit of gain than did the various calcium-phosphorus levels.

The effect of cooling eggs on the size of the air cell, E. M. FUNK (*U. S. Egg and Poultry Mag., 42 (1936), No. 1, p. 30, fig. 1*).—In this brief note from the Missouri Experiment Station, data are presented to show that cooling eggs to low temperatures produces an air cell of considerable size. It is suggested that in grading eggs some tolerance should be allowed for the effect of cooling on the size of the air cell.

Results of cooling eggs by different methods on farms, E. M. FUNK (*U. S. Egg and Poultry Mag., 41 (1935), No. 5, pp. 14–18, 62–64, figs. 7*).—In this contribution from the Missouri Experiment Station, it is noted that the time required to cool eggs from high temperature (from 92° to 102° F.) to below 68° in a 50° room was 1, 3, 5, 10, and 16 hr. for a single egg, eggs on a wire tray, in a wire basket, in a galvanized pail, and in a case, respectively. Circulation of air in the cooler greatly hastened the rate of cooling, especially when the eggs were held in wire trays or baskets.

Assuming a cooling efficiency of 100 percent for a single egg held in the cooler without forced air circulation, the cooling efficiency of the eggs held in various containers was for a wire tray 37 percent, a wire basket 27 percent, a wire basket with air circulation 120 percent, a galvanized pail 16 percent, and in a case 8 percent. Chilling and lining or wrapping the case retarded the rate of rise in temperature when the eggs were removed from the cooling room.

Freezer burn on refrigerated poultry, D. K. TRESSLER (*U. S. Egg and Poultry Mag., 41 (1935), Nos. 9, pp. 33–46, figs. 2; 10, pp. 38–41*).—This article from the New York State Experiment Station presents a critical review of the literature dealing with freezer burn on refrigerated poultry and outlines a plan of research to determine means for its prevention.

Sex differentiation in day-old ducklings, P. J. SERFONTEIN (*Farming in So. Africa, 10 (1935), No. 113, pp. 349, 350, figs. 2*).—A detailed description of the method of examining ducklings for sex determination immediately after removal from the incubator is presented. It is stated that on opening the cloaca of the male, there is a distinctly visible organ which is absent in the female. The opinion is expressed that a person after examining 25 individuals should be able to determine sex with 100 percent accuracy.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle in Florida], R. B. BECKER, W. M. NEAL, P. T. D. ARNOLD, and A. L. SHEALY (*Florida Sta. Rpt. 1935, pp. 50, 51, 52, 53, 56*).—Data obtained in tests with dairy cattle are reported on deficiencies in feeds used in cattle rations, the ensilability of *Crotalaria intermedia*, Napier grass, sorghum, and sugarcane, the digestibility coefficients and feeding value of dried grapefruit refuse, and the feeding value of crotalarias.

[Investigations with dairy cattle and dairy products in Idaho], D. R. THEOPHILUS (*Idaho Sta. Bul. 220 (1936), pp. 26–28, 29, 30, fig. 1*).—Results are given from studies with dairy cattle on the continuous use of proved sires for maintaining high production, the value of breeding efficiency to dairymen, the difference between the Eckles standard and the observed weight and height of Holstein females in Idaho, the feed utilizing efficiency of high producing Holstein cows, and variations in the solids-not-fat content of the milk of individual cows within the Holstein and Jersey breeds.

In tests with dairy products, information was obtained on the importance of thorough washing and sterilizing of the separator in producing good quality cream, and the relationship between the extraneous matter in cream and the amount of extraneous matter in the finished butter.

[Investigations with dairy cattle and in dairy production in Michigan], E. L. ANTHONY and E. D. DEVEREUX (*Michigan Sta. Rpt. 1935, pp. 177, 178, 214, 215*).—The results obtained in studies with dairy cattle are reported on the vitamin D content of corn silage and the vitamin D requirement of growing calves, the value of alfalfa hay in the ration of dairy cattle, and the effect of supplementing a basic ration of low phosphorus alfalfa, corn silage, and corn with bonemeal on growth, reproduction, and milk production of dairy cattle.

Studies with dairy products produced data on indophenol substitutes for methylene blue in the reduction test, synthetic media for bromothymol blue test, a sanitary survey of the milk produced in the Lansing milkshed, the homogenization of milk, the effect of heat on certain chemical and physical properties of milk, the effect of sugar beet tops on the flavor of milk, and influence of source of fat and serum solids on the quality and overrun of ice cream.

[Investigations with dairy cattle by the Montana Station] (*Montana Sta. Rpt. 1934, pp. 49, 50, 71, 72*).—Studies with dairy cattle produced results on the use of rye as a grain feed for dairy cattle, and at the Huntley Substation on the value of high quality roughages for economical milk and butterfat production, cutting pasture grasses for soiling and silage, the use of Reed canary grass as a pasture crop, the use of an open-shed type barn for dairy cattle, and securing superior germ plasm in dairy cattle.

[Investigations with dairy cattle and dairy products in New Jersey] (*New Jersey Stas. Rpt. 1935, pp. 6, 7, 25–32, 33, 34, 35, 36*).—Information obtained in studies with dairy cattle are reported on the effect of processing on the carotene content of alfalfa hay, analyses of alfalfa-timothy hay silage, inbreeding and outcrossing Holstein dairy cattle in establishing genetic factors for high milk and fat production, color pigmentation in the skin and milk of Guernsey dairy cattle, methods of winter feeding of dairy heifers and their relationship to growth on summer pasture, the value in a dairy ration of dehydrated molasses, grass silage, dehydrated roughage, and animal byproducts, the yield of green grass for ensilling from timothy sod treated with varying applications of calcium cyanamide, and grass silage as a means of growing more feed units.

In studies with dairy products results were obtained in tests on the effects of certain fatty acids and their triglycerides on the processing of dairy products, and methods employed in standardizing milk.

[Experiments with dairy cattle in South Dakota], T. M. Olson (*South Dakota Sta. Rpt. 1935, pp. 24–26*).—Results obtained in tests with dairy cattle are reported on a comparison of sweetclover, alfalfa, Sudan grass, and permanent pasture mixtures under South Dakota conditions; the influence of roughage on the vitamin D potency of milk; the effect of tankage on flavor in milk; the effect of breeding on the vitamin D potency of milk; effect of sunlight on the milk of dairy cows; and variations in the calcium and phosphorus content of cows' milk during the lactation period.

Molasses hay silage, C. B. Bender, H. H. Tucker, W. C. Krueger, K. O. Pfau, and A. S. Fox (*Jour. Dairy Sci., 19 (1936), No. 2, pp. 137–146, figs. 5*).—This contribution from the New Jersey Experiment Stations deals with the preparation of silage from legumes and mixed grasses of both high and low moisture content, 40 lb. of molasses per ton being added in each case. Special note was made of temperatures developed during the ensilling process by means of thermocouples placed at various levels and distances from the walls as the the silo was filled.

The low moisture silage reached a maximum temperature of 141° F. on the seventh day and continued to rise during the latter part of the storage period, reaching a maximum of 157.7°. The temperature of the high moisture silage as a whole remained well under 100°, with 103° the maximum recorded. On opening the silo the low moisture silage was found practically unfit for feeding, ranging from a very dry moldy condition near the edge to black and charred material near the center of the lower section. Practically all lactic acid type bacteria had been destroyed. The high moisture silage was in excellent condition, with no signs of burning or rotting, and showed very small loss of nutrients during the ensilling process.

Effects of uncomplicated phosphorus deficiency on estrous cycle, reproduction, and composition of tissues of mature dairy cows, C. H. Eckles, L. S. Palmer, T. W. Gullickson, C. P. Fitch, W. L. Boyd, L. Bishop, and J. W. Nelson (*Cornell Vet., 25 (1935), No. 1, pp. 22–43; abs. in Minnesota Sta. Rpt. 1935, p. 39*).—Continuing the study of phosphorus deficiency (E. S. R.,

70, p. 233), this experiment was designed to determine the effect of such deficiency upon the oestrous cycle of cows. The ration used was designed to provide an adequate supply of all minerals except phosphorus. The animals were kept in a barn and exercised in a dry lot free of vegetation. Careful watch was kept for physiological evidences or external symptoms of heat. In addition a careful physical examination was made of the reproductive organs at intervals of 30 days.

It was found that uncomplicated phosphorus deficiency could be experimentally produced in mature dairy cows and continued for two or three years without causing abnormal oestrum. The condition did appear to reduce breeding efficiency. It is concluded that the disturbances in oestrum and the low calf crop among cattle in phosphorus-deficient areas were probably due to the complicated nutritive deficiencies prevalent under such conditions.

The effect of ingested cod liver oil, shark liver oil, and salmon oil upon the composition of the blood and milk of lactating cows, C. M. McCAY L. A. MAYNARD, ET AL. (*Jour. Biol. Chem., 109 (1935), No. 1, pp. 29–37, fig. 1*).—In the first of two experiments from the [New York] Cornell Experiment Station, two cows were fed for 4 weeks on normal herd rations, then for 4 weeks on the same ration plus 168 cc of cod-liver oil daily. No relation was noted between oil feeding and the composition of the blood other than an increase in the iodine number of the plasma lipids. Total lipids in mammary plasma were consistently lower than in jugular plasma, indicating that the gland removes lipids in some form from the blood. There was a rapid drop in milk fat during the first week of cod-liver oil feeding and the minimum was reached during the second week, with the fat content returning to normal within 2 weeks after oil feeding was discontinued.

In the second trial five cows were fed for alternate 2-week periods with and without oil in the ration to determine the effect of straight cod-liver oil, the saponifiable and nonsaponifiable fractions of cod-liver oil, shark oil, and salmon oil on the composition of milk. The usual lowering of milk fat during the cod-liver oil period, both under dry lot and pasture conditions, was noted. The effect of both the shark and salmon oil was much less and very inconsistent, indicating that perhaps they do not act like cod-liver oil. The nonsaponifiable fraction of cod-liver oil had no effect on milk fat, while the saponifiable fraction seemed to carry the injurious substance. It is suggested that the fraction causing muscle lesions in Herbivora may be the same as that which depressed fat secretion.

The decrease in the lactose content of milk following the production of artificial hypoglucemia, W. R. BROWN, W. E. PETERSEN, and R. A. GORTNER (*Jour. Dairy Sci., 19 (1936), No. 2, pp. 147–154, figs. 3*).—In this experiment at the Minnesota Experiment Station, artificial hypoglucemia was produced in dairy cows through repeated intravenous injections of insulin. The results of three trials are presented. From 800 to 1,000 units of insulin were used, the number of injections varying from 2 to 5.

Each case resulted in a marked hypoglucemia, followed by a decrease in the lactose content of the milk in each instance. No paresis or coma was noted in any of the animals. Milk samples were taken at frequent intervals to follow the trend of lactose synthesis. In general, the milk sugar curves followed the blood sugar curves by approximately 1 hr., and when correlated on this basis the correlation was 0.6084 ± 0.19. A rise in lactose content of the milk was noted at about the normal evening milking period, which was probably due to an outpouring of stored milk secreted before the onset of the experimental hypoglucemia.

Soybean flour as a substitute for cow's milk in feeding dairy calves, L. SHOPTAW (*Jour. Dairy Sci., 19 (1936), No. 2, pp. 95–99, figs. 2*).—In this study at the [Oklahoma] Panhandle Experiment Station, soybean flour was fed as a gruel to a group of four dairy calves for 70 days in comparison with a similar check group fed whole milk and skim milk. The calves were 25 days of age at the beginning of the trial. Both groups had free access to both grain mixture and alfalfa hay.

The soybean flour group consumed less of the liquid feed, more grain, and less hay than the milk-fed group, was less thrifty, subject to considerable diarrhea, and did not relish the soybean milk at the start. They gained 0.9 lb. daily in weight and a total of 4.37 in. in height at withers during the trial as against 1.24 lb. and 4.94 in. for the milk-fed calves.

Estimating the weights of dairy cows from heart-girth measurements, J. F. KENDRICK and J. B. PARKER (*U. S. Dept. Agr., Bur. Dairy Indus., 1936, BDIM–695, pp. 2*).—A table is presented for estimating the live weight of dairy animals from heart-girth measurements, based on a study of 1,721 actual weights and heart-girth measurements of Holstein and Jersey cattle.

Information on dairy herd-improvement associations, J. F. KENDRICK (*U. S. Dept. Agr., Bur. Dairy Indus., 1936, BDIM–692, pp. 10*).—A list of 43 questions and answers pertaining to dairy herd improvement associations is presented.

DHIA proved-sire list, I, compiled by J. F. KENDRICK (*U. S. Dept. Agr., Bur. Dairy Indus., 1936, BDIM–706, pp. 58*).—This is a list of 385 dairy sires proved for production in Dairy Herd Improvement Association work in the various States, along with the average mature equivalent production of the proving daughters and of their respective dams.

Organizing cooperative dairy bull associations, J. G. WINKJER (*U. S. Dept. Agr., Bur. Dairy Indus., 1936, BDIM–691, pp. 8*).—Suggestions are made regarding the plan of organization, the selection of bulls, and the operation of cooperative bull associations.

Milk goats coming into their own, J. C. MARQUARDT (*Farm Res. [New York State Sta.], 2 (1936), No. 4, p. 12, fig. 1*).—The present status of the milk goat industry and the attempts that are being made to improve the quality of goat milk are discussed.

Investigations on the milk of a typical herd of Shorthorn cows, II, J. GOLDING, J. MACKINTOSH, and E. C. V. MATTICK (*Jour. Dairy Res. [London], 6 (1935), No. 1, pp. 6–25, figs. 2*).—Continuing this study (E. S. R., 70, p. 520), summaries are presented covering the fourth and fifth years of the investigation. Special emphasis is laid on the unusual composition of milk noted during the drought in the summer of 1933, especially the abnormal fall in solids-not-fat, lower values for formol titration and phosphorus, and a longer time for rennet coagulation. Daily records covering this period are presented.

The analysis of weekly composite samples showed relatively high values for titratable acidity, formol titration, ash, calcium, and phosphorus from October to February, followed by a general decrease during the summer months. Determinations of pH values and freezing point showed little seasonal variation. The possibility of a close association between nonfatty solids and phosphorus content is suggested.

Seasonal variation of the percentage butterfat content of milk: An examination of the results of certain individual cow tests, C. D. OXLEY (*Jour. Dairy Res. [London], 6 (1935), No. 1, pp. 1–5*).—A statistical analysis, including the means and standard deviation of the butterfat percentage of approximately 3,200 milk samples and representing both morning and evening

milkings for each of the four quarters of the year, is presented, with a discussion of the probable source of error due to the nature of the samples.

It is noted that the means of the afternoon samples for July–September and for October–December are significantly higher than for January–March, but not significantly higher than for April–June, nor is the latter higher than for January–March. In the case of the morning samples the means for July–September and for October–December are significantly higher than for the other two seasons, with little difference noted between the January–March and April–June quarters.

The relation of the amino nitrogen content to quality of cream and butter, D. H. JACOBSEN (*Jour. Dairy Sci., 19 (1936), No. 2, pp. 125–136, fig. 1*).—In experiments at the South Dakota Experiment Station, 27 churnings were made from lots of cream graded as second grade sour, first grade sour, and fresh sweet cream. Samples of cream and buttermilk were analyzed for amino nitrogen at churning time, and butter samples were similarly analyzed and also scored for quality when fresh and after 1, 3, and 6 mo. in storage.

Based on acidity and flavor of cream, the percentage of total nitrogen occurring as amino nitrogen increased as the quality of cream decreased. In general, cream and butter containing the higher percentage of amino nitrogen gave lower butter scores, although considerable overlapping of grades was noted. Classification of churnings on the basis of amino nitrogen content of cream alone failed to determine satisfactory butter flavor grades. The lowest score of butter showed the highest percentage of total nitrogen occurring as amino nitrogen, both fresh and at each stage of storage. Apparently the amino nitrogen content may be of aid in cream grading only when used in combination with flavor and acidity tests.

Babcock testing and other methods of analyzing dairy products, L. K. CROWE (*Nebraska Sta. Circ. 53 (1936), pp. 40, figs. 17*).—This publication contains information about and directions for using the Babcock and other methods for testing milk, cream, skim milk, buttermilk, whey, butter, and other dairy products for their principal constituents. Typical problems in dairy arithmetic are included.

Determining cleanliness of milk supplies, M. W. YALE (*Farm Res. [New York State Sta.], 2 (1936), No. 4, pp. 5, 10*).—In this article the author describes some of the methods used in examining milk for cleanliness and discusses the limitations of the methods.

The evaluation of the germicidal potency of chlorine compounds, I, II, C. K. JOHNS (*Sci. Agr., 14 (1934), No. 11, pp. 585–607, fig. 1, Fr. abs., p. 607; 15 (1934), No. 4, pp. 218–227, figs. 4, Fr. abs., p. 227*).—This investigation was carried on at the Central Experimental Farm, Ottawa.

I. *Hypochlorites.*—In the first study results are presented on several methods for evaluating the germicidal potency of hypochlorite sterilizing products. Two new test methods, an indicator test for pH, and a microscopic slide biological test were developed, both of which are considered promising. Certain discrepancies are noted which occur in rating the various concentrations by different test methods, and which apparently are due to the differences in the buffer capacities of the product. Most accurate results are obtained by testing freshly prepared solutions.

The results indicate that the influence of the pH of the solution is greater than the concentration of available chlorine, particularly in dilute solutions, in determining its germicidal potency.

II. *Chloramine-T products.*—The germicidal potency of five commercial chloramine-T products and of U. S. P. chloramine-T in varying concentrations

was determined. Within a range of 2,000 to 25 p. p. m., each of the commercial products showed a gradual decline in germicidal activity on dilution, whereas the U. S. P. product behaved differently, showing decreased germicidal potency as the concentration was reduced from 2,000 to 1,000 p. p. m., then showing increased activity as the concentration was further reduced to 200 p. p. m., falling off again beyond that point.

Note is made of an unusual pH reaction of the commercial products studied, in that each became more alkaline on dilution with water having a slight acid reaction, while U. S. P. chloramine-T decreased in alkalinity on dilution, reacting similarly to hypochlorite solutions. This unusual reaction is attributed to the presence of sodium bicarbonate in the commercial product, and probably accounts for the difference in germicidal potency of the commercial and U. S. P. compounds.

A comparison of ten presumptive test media used in the detection of the Escherichia-Aerobacter group in milk, M. A. FARRELL (*Jour. Bact., 30 (1935), No. 6, p. 654*).—In an investigation by the Pennsylvania Experiment Station of 10 of the better-known presumptive test media proposed for use in water and milk analysis, brilliant-green lactose bile, fuchsin lactose broth, and methylene-blue brom-cresol-purple broth proved superior, detecting the *Escherichia-Aerobacter* group of bacteria in milk in 53 percent of the samples examined. The remaining seven media were 20 percent less efficient in the detection of this group.

Concerning the habitat of Streptococcus lactis, P. STARK and J. M. SHERMAN (*Jour. Bact., 30 (1935), No. 6, pp. 639–646*).—In this study at the [New York] Cornell Experiment Station, *S. lactis* was consistently isolated from certain plant sources, including fresh corn (grain and silks) and dried navy beans. It was also obtained from cabbage, head lettuce, garden peas, and wheat middlings, though with some difficulty. When these isolated strains were tested with respect to their actions on arabinose, xylose, sucrose, and mannitol, they were found to correspond quite closely with the strains from milk, although wide variations were noted in the behavior of the various strains from this small group.

The organism was not isolated from all plant sources examined, neither was it found in the mouths or throats of cows, bovine feces, human feces, or in soil. It is demonstrated that *S. lactis* does occur on plants, and it is suggested that they may represent the natural habitat of the organism.

Types of Oospora found in butter, C. M. SORENSEN and E. H. PARFITT (*Jour. Bact., 31 (1936), No. 1, pp. 86, 87*).—In examining acidulated potato dextrose agar plates of 600 samples of pasteurized commercial sour cream butter at the Indiana Experiment Station, a difference was noted in the appearance of the *Oospora* colonies that grew on these plates.

From cultures made from those colonies differing in appearance apparently eight different varieties were obtained, all of which could be characterized as *O. lactis*. Significant differences were found within these cultures as to caseolysis, lipolysis of milk and tributyrin, growth rates, optimum temperature, and majority thermal death point, also in their production of caseolytic and lipolytic enzymes.

The relation of Oospora lactis to the keeping quality of butter, O. H. AUSH and H. MACY (*Amer. Creamery and Poultry Prod. Rev., 79 (1934), No. 6, pp. 190–194; abs. in Minnesota Sta. Rpt. 1935, p. 35*).—A study was made at the Minnesota Experiment Station of the effect of *O. lactis* on unsalted butter. On the basis of their activity or rapidity of growth, seven varieties of the fungus were selected from approximately 100 cultures isolated from different grades of commercial butter for use in this study.

The fungus grew well in unsalted butter stored at 10° C. (50° F.), whether the butter was made from sweet, sour, raw, pasteurized, or autoclaved cream. There was no direct correlation between the fungus count and the quality of the butter after storage. The temperature and period of incubation of infected cream did not consistently influence the fungus or the score of the butter after storage. Whether grown in sweet or sour cream, *O. lactis* was not a factor in the deterioration of butter made from such infected cream. No correlation existed between the fungus count and acidity of the cream, with the score of the butter after storage, or between the acidity of the cream and the score of the butter after storage. The fungus was capable of destroying the substances responsible for the flavor of fine starter butter.

Butter worked with *O. lactis*-infected equipment or inoculated during the working process and stored at —23° had a higher fungus count than butter made from infected cream. Pasteurizing temperatures above 60° for 30 min. or 82° by the flash method and autoclaving at 118° for 30 min. destroyed the fungus in cream, but the keeping quality of the butter was not materially improved. The fungus count of salted butter decreased with increasing brine concentrations, although it remained relatively high even at 20-percent concentration. Salt improved the keeping quality of *Oospora*-infected butter, and a 1.5-percent concentration was as effective as 3 percent. Butter stored at —23° had better keeping qualities than that stored at either 2° or 10°. The seven cultures of *O lactis* studied, whether grown alone or in combination, were ineffective in influencing the keeping quality of autoclaved sweet cream or storage butter, except that the starter flavor was destroyed.

Effect of temperature, salt, and acidity on growth of mould (Oospora lactis), H. MACY and A. E. ANDERSON (*Natl. Butter and Cheese Jour., 25 (1934), No. 22, pp. 28, 29; abs. in Minnesota Sta. Rpt. 1935, p. 31*).—The Minnesota Experiment Station made a study of the effects of salt concentration, temperature, and acidity on the growth of seven cultures of *O. lactis* on whey agar and in buttermilk.

Growth was extensive in the controls on all media at 20° C. (68° F.), less luxuriant at 10° and 2°, and entirely checked at —23°. Except when the pH of whey agar was low, there was no permanent effect on the viability of cultures due to low temperatures. The growth on whey agar was affected when the salt concentration exceeded 1 percent and was entirely checked at 10 percent. On buttermilk growth was usually retarded at a salt concentration above 2.5 percent and stopped at 10 percent. The degree of acidity did not in itself have a very marked effect on the extent of growth. The combined effects of high salt concentration and low temperatures and/or pH concentration were noticeable.

A method of preparing churned cultured buttermilk, C. L. ROADHOUSE and E. E. BROWN (*California Sta. Circ. 339 (1936), pp. 12, figs. 4*).—Methods for preparing starters, the handling of milk and cream, and the churning process are discussed. Suggestions regarding cooling, bottling and storage, delivery, and care of equipment are also presented.

French contributions to the art of cheese-making, R. S. BREED and C. D. KELLY (*Farm Res. [New York State Sta.], 2 (1936), No. 4, pp. 3, 9, figs. 4*).—Continuing this series of articles (E. S. R., 75, p. 250), the types of cheeses produced in France are described.

Methods of making cottage cheese on the farm, L. H. BURGWALD (*Ohio Sta. Bimo. Bul. 181 (1936), pp. 92, 93*).—Processes are described.

The age thickening of sweetened condensed milk.—IV, The effect of salts, V. C. STEBNITZ and H. H. SOMMER (*Jour. Dairy Sci., 19 (1936), No. 2, pp.*

101–115, fig. 1).—Continuing this series of studies (E. S. R., 75, p. 250), data are presented on the effect of adding certain salts to both stable and unstable milks before and after condensing as regards the stability of the finished product toward age thickening.

The results indicate that stable condensed milk cannot be further stabilized by the addition of sodium citrate, disodium phosphate, or calcium acetate. The addition of sodium citrate to unstable milk either before or after condensing had a pronounced stabilizing effect, while disodium phosphate added to unstable milk before condensing had only a slight stabilizing effect. The addition of calcium acetate or disodium phosphate after condensing caused a rapid thickening. Results are presented to show that there is no correlation between the alcohol test and the stability of sweetened condensed milk toward age thickening.

Using frozen cherries in cherry ice cream, J. C. HENING (*Ice Cream Trade Jour., 31 (1935), No. 11, p. 16*).—In this brief report from the New York State Experiment Station it was demonstrated that common varieties of sour cherries, when packed in the ratio of 4 parts of cherries to 1 part of sugar and frozen, could be used later to produce a very satisfactory cherry ice cream. Additional sugar was added as the cherries were thawed, and the cherries and sirup were added to the ice cream mix early in the freezing period in the ratio of 30 parts of cherries to 70 parts of mix. This high percentage seemed desirable, due to the mild flavor of the cherry.

VETERINARY MEDICINE

Treatise on exotic veterinary and comparative pathology.—II, Microbe diseases, G. CURASSON (*Traité pathologie exotique vétérinaire et comparée.—II, Maladies microbiennes. Paris: Vigot Bros., 1936, pp. 689*).—The second of the three volumes of this work (E. S. R., 75, p. 102) deals with the visible microbe (including fungus) diseases. Bibliographical lists of references accompany the accounts of the several diseases.

[Report of work in animal pathology by the Florida Station] (*Florida Sta. Rpt. 1935, pp. 50, 55, 56, 58, 59, 129*).—The work of the year with animal diseases referred to (E. S. R., 73, p. 236) includes the etiology of fowl paralysis and leukemia, by M. W. Emmel, reports relating to which have been noted (E. S. R., 74, pp. 700, 856; 75, p. 547); investigations of hemorrhagic septicemia in cattle and swine, by D. A. Sanders; effect of feeding colon organisms and dried whey on the bacterial flora of baby chicks affected with pullorum disease, by Emmel; a study of plants poisonous to livestock in Florida, by Sanders, Emmel, and E. West, including *Cassia occidentalis*, *Crotalaria spectabilis*, cocklebur, tungseed meal, and *Glottidium vesicarium*; and cattle parasites under Everglades conditions, by R. W. Kidder.

[Report of work in animal pathology by the Idaho Station] (*Idaho Sta. Bul. 220 (1936), pp. 22–25, 45–47, fig. 1*).—The work of the year in animal pathology referred to (E. S. R., 74, p. 99) includes further work with grubs in the head of sheep (sheep batfly), tests for pullorum disease control, cure of foul sheath in rams by the use of copper sulfate, udder infections, transmission of paratyphoid in turkeys through the eggs, flock resistance to fowl paralysis, and a new disease of turkeys due to a paratyphoid organism of the *Salmonella aertrycke* type.

[Report of work in animal pathology, parasitology, and bacteriology by the Michigan Station] (*Michigan Sta. Rpt. 1935, pp. 162–176, 177, 179, 180, 180–201, figs. 2*).—The work of the year reported upon (E. S. R., 73, p. 536)

relates to Bang's disease control and horse parasite control, both by B. J. Killham; bromothymol blue broth in the detection of mastitis streptococci, by E. D. Devereux; mastitis studies, by C. S. Bryan; vaccination of cattle against Bang's disease, by I. F. Huddleson; coccidiosis control experiments and control of intestinal worms of poultry, both by W. L. Chandler; tapeworm infestation, coccidiosis immunity work, the effect of chronic coccidiosis on the growth, production, and mortality of laying pullets, roup vaccination, infectious laryngotracheitis vaccination, and autopsies in connection with work in avian pathology, all by H. J. Stafseth; and a note on the influence of high frequency alternating current on animals, by H. T. Graham and F. W. Fabian.

[Report of work in veterinary medicine by the Montana Station] (*Montana Sta. Rpt. 1934, pp. 52–54*).—The work of the year is briefly referred to, with particular reference to control of infectious abortion, foot rot of sheep, arthritis in lambs, and acute diarrhea in lambs.

[Work in animal pathology by the New Jersey Stations] (New Jersey *Stas. Rpt. 1935, pp. 34, 77, 78*).—The work of the year referred to (E. S. R., 73, p. 236) includes a study of the methods of controlling Bang's disease, infectious laryngotracheitis of the fowl, paratyphoid infection of pigeons, fowl paralysis, and swine erysipelas infection in turkeys.

[Work in animal pathology by the South Dakota Station] (*South Dakota Sta. Rpt. 1935, pp. 18, 19–22, 35–45, 47, 48*).—The work of the year referred to (E. S. R., 73, p. 236) includes a chenopodium experiment in worming pigs, earlier studies of which by LeBlanc, Wright, and Taylor have been noted (E. S. R., 71, p. 537); studies of so-called "alkali disease" due to selenium intoxication, by K. W. Franke; pharmaceutical studies of chenopodium, by F. J. LeBlanc; and the progress of work with hemorrhagic septicemia, by C. C. Lipp.

Toxicity tests on African rue (Peganum harmala L.), W. L. Black and K. W. Parker (*New Mexico Sta. Bul. 240 (1936), pp. 14, figs. 8*).—Livestock losses in a localized area a short distance east of Deming, N. Mex., in the early spring months of 1934 and 1935 led to studies of the palatability and possible toxicity to cattle and sheep of *P. harmala*, suspected of being the cause.

The plant was shown to be unpalatable, being eaten by cattle and sheep only when they are in a starving condition. The unpalatability was reduced by drying, but cattle and sheep refused to eat hay made of it when kept before them in a feed lot for several days.

The amounts fed to the animals in the experiment gave no indication that consumption by cattle or sheep is detrimental to their health. "A dosage of 44.5 g (1.57 oz.) of the seed per day over a period of 4 days is apparently harmless to an 89-lb. sheep. A dosage of 160.3 g per day of the mature leaves and stems over a period of 26 days was likewise harmless to sheep weighing 77 and 63 lb. A dosage of 136.2 g per day of the young leaves and stems without seed pods continued over a period of 20 days was harmless to sheep weighing 59 and 89 lb. Grazing for a period of 33 days in a pasture containing no other vegetation failed to produce any noticeable effects upon sheep.

An average daily dose of 250.6 g of mature seed fed to a 780-lb. cow for a period of 29 days failed to produce unfavorable symptoms in the animal. An average daily feeding of 667.6 g of mature leaves and stems fed to an 890-lb. cow for a period of 26 days had no effect upon the animal, and an average daily dose of 406 g of young leaves and stems without seed pods fed to an 880-lb. cow for a period of 15 days produced no ill effects. A test in which the animal was confined for a period of 33 days to a pasture with no other

vegetation present and with the supplemental feeding of a daily average of 568 g of mature leaves and stems, including seed pods, over a period of 24 days failed to produce any noticeable effects on a 760-lb. cow.

Organ specificity of the parasite Eimeria tenella, C. A. HERRICK (*Jour. Parasitol., 22 (1936), No. 2, pp. 226, 227*).—It is considered apparent from the studies conducted that (1) "the sporozoites of *E. tenella* localized in the epithelium of a cecal pouch through which all intestinal material had passed for a period of 4 days with all the resulting changes in physiology, and (2) the sporozoites escaped from the oocysts and established themselves in the normal and translocated cecal pouches after passing through only the anterior half of the duodenal loop of the chicken."

The Australian epidemic of encephalomyelitis (X-disease), J. R. PERDRAU (*Jour. Path. and Bact., 42 (1936), No. 1, pp. 59–65, pls. 3*).—The Australian X disease studied by Cleland et al. (E. S. R., 41, p. 876) was caused by a virus with characteristics so closely resembling those of the virus of louping ill that differentiation between them on the evidence now available is well-nigh impossible, but no claim is made that they are one and the same virus.

Observations upon the migrations and pathogenesis of Gasterophilus larvae, D. E. FAULKNER and A. A. KINGSCOTE (*Jour. Parasitol., 22 (1936), No. 2, p. 228*).—The authors record the presence of the larvae of *Gasterophilus* in the lumen of the esophagus, their absence in submucous and periesophageal tissues, and the occurrence of a marked edema in the gastric submucosa.

Inapparent (subclinical) infection of the rat with louping-ill virus, F. M. BURNET (*Jour. Path. and Bact., 42 (1936), No. 1, pp. 213–225*).—In the work reported rats have shown no manifest evidence of infection after intranasal inoculation with louping ill virus, but the virus regularly appears and apparently multiplies in the olfactory bulbs. While it has not been possible to provide proof that multiplication of louping ill virus in rats takes place only within the cells of the nervous system, all available data support this inference.

A sequel to a public health ruling concerning streptococcic mastitis, C. S. BRYAN and G. J. TURNEY (*Amer. Jour. Pub. Health, 26 (1936), No. 5, pp. 517–520*).—This contribution from the Michigan Experiment Station reports upon the outcome of control work with streptococcic mastitis in dairy herds conducted by the city of Lansing in an effort to increase the quality of raw milk and suppress any possible health hazard. The mastitis-affected animals were removed from herds supplying milk to the city, and herd retests are being made every 6 mo. The elimination of infected cows has resulted in a marked decline in the herd wastage and the production of a higher quality of milk.

Mastitis from the manufacturers' and distributors' viewpoint, F. B. HADLEY (*Vet. Med., 31 (1936), No. 5, pp. 207–209*).—This is a contribution from the Wisconsin Experiment Station.

A note on the influence of culture media on the isolation of Pasteurella from equine cerebral tissue of artificially inoculated horses, R. GRAHAM (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 1, pp. 59–64, fig. 1*).—The results obtained in cultural studies on equine cerebral tissues taken from horses immediately following death from artificial *Pasteurella* inoculation suggest that the type of media selected for direct propagation of *Pasteurella* strains is important in accurately appraising the presence or absence of a cerebral *Pasteurella* infection of the equine encephalon. Different types of liquid media discussed, upon being inoculated with bits of cerebral tissue, yielded positive results in all three horses, while the same cerebral tissue specimens heavily seeded on plain agar and gentian violet-agar plates proved negative.

An epidemic of Pasteurella infection in a guinea-pig stock, J. WRIGHT (*Jour. Path. and Bact., 42 (1936), No. 1, pp. 209–212*).—An account is given of an epidemic of fibrinopurulent serositis in a guinea pig colony caused by a member of the *P. septica* group.

Criteria for the accurate classification of the rickettsial diseases (rickettsioses) and of their etiological agents, H. PINKERTON (*Parasitology, 28 (1936), No. 2, pp. 172–189, pls. 2*).—Morphological, histopathological, and immunological studies of seven strains of rickettsial disease have led to the conclusion that they represent two widely separated groups for which typhus and spotted fever seem the most logical names.

"Diseases of the spotted fever group are carried by ticks (Arachnoidea) and characterized by distinctive histopathological lesions—thrombonecrosis of arterioles and venules, with micro-organisms of definite and characteristic morphology, invading smooth muscle cells, as well as endothelium, mesothelium, and macrophages. Tissue culture studies show massive invasion and distention of cell nuclei, while cytoplasmic invasion of host cells is relatively sparse.

"Diseases of the typhus group are carried by lice and fleas (Insecta) and characterized by the facts that the intracellular parasite which causes them invades only endothelium and mesothelium, distends the cytoplasm of its host cells without ever invading nuclei, and in guinea pigs causes only proliferative endangeitis without thrombonecrosis.

"In the spotted fever tick, organisms are intranuclear as well as intracytoplasmic, invade nearly all types of tissue, and are transmitted hereditarily. In typhus-infected lice and fleas, organisms are intracytoplasmic only, infect only the lining cells of the gut, and are not transmitted hereditarily."

Staphylococci from animals, with particular reference to toxin production, F. C. MINETT (*Jour. Path. and Bact., 42 (1936), No. 1, pp. 247–263*).—The author has found the production of β toxin to be a characteristic feature of hemolytic staphylococci from animals. "Thus out of 97 strains from various animal sources, mostly cow's milk, only 5 failed to form recognizable amounts of β toxin. Ten strains, including 8 from dogs, produced β toxin and only very small or undetectable amounts of α toxin. The staphylococci from dogs were also distinguished by their greater proteolytic power in culture. The α unitage of cow serum is generally below 7.0 and the β unitage generally 0.45y or less."

Turning sickness, a protozoan encephalitis of cattle in Uganda: Its relationship with East Coast fever, R. W. M. METTAM and J. CARMICHAEL (*Parasitology, 28 (1936), No. 2, pp. 254–283, pl. 1*).—A description is given of this specific disease which occurs sporadically in the East Coast fever areas of eastern equatorial Africa. "Clinically, acute cases are characterized by peculiar nervous symptoms, absence of fever, and blindness. Death occurs in most cases within 2 to 21 days of the onset of illness. Chronic cases are encountered from time to time and may survive up to 6 mo. The disease is widespread in Uganda. It affects cattle of both sexes and all breeds and is commonest in young stock between 6 mo. and 2 yr. of age. It has, however, been observed in older animals.

"Pathologically, in acute cases petechial hemorrhages or extravasations are found in various parts of the brain and meninges. Generally the hemorrhages are small and do not seriously injure the adjacent brain tissue. In some cases the extravasations are responsible for a considerable amount of damage. Microscopic examination shows that the brain lesions are due to extensive embolism of cerebral vessels. The lymphocytes which form these emboli contain in their cytoplasm protozoan bodies indistinguishable in structure from the schizonts

of the genus *Theileria*. These bodies occur in great numbers in the brain but are extremely rare or absent in the lymphocytes of other parts of the body. In chronic cases the hemorrhages have been absorbed, but the brain is permanently damaged by replacement changes and by the appearance of small cysts or cavities which contain a citron colored fluid. These cavities when numerous seriously disorganize certain parts of the brain.

"The disease has not yet been transmitted experimentally, and its connection with the theileriases is still uncertain. However, much evidence has been collected to show that cases of turning sickness have been infected with East Coast fever some time previously, generally on an average of 6–8 mo. The possible relationship between turning sickness and East Coast fever is discussed at some length."

The role of the rat flea in the transmission of typhus, G. COVELL and D. R. MEHTA (*Indian Jour. Med. Res., 23 (1936), No. 4, pp. 921–927, fig. 1*).—In a study of typhus in the Simla Hills a strain was recovered from rat fleas collected from wild rats which has been maintained in guinea pigs for 17 generations. "A strain of typhus originally derived from the brains of wild rats has been transmitted from an experimentally infected white rat to a normal white rat by means of the rat flea, *Xenopsylla cheopis*. The clinical and serological reactions produced in laboratory animals by infection with the strain were unaltered by its passage through the flea. Rickettsiae morphologically indistinguishable from those observed in laboratory animals inoculated with passage virus have been demonstrated in fleas fed on experimentally infected white rats. Our results indicate that there is a great multiplication of rickettsiae in *X. cheopis*, thus confirming the observations of workers in other countries."

The effect on rodents of Bacillus typhi murium cultivated in rye grain by a new method used at the Pasteur Institute as compared with the virus from ampoules [trans. title], A. CHAPPELLIER (*Ann. Épiphyt. et Phytogénét., n. ser., 1 (1934–35), pp. 341–348, figs. 4*).—The author has found *B. typhi murium* as cultivated in rye grain by a new method emp'oyed at the Pasteur Institute of Paris to be quite generally consumed by 10 species of rodents tested and often in the presence of their natural food. Two species tested appeared to be resistant to the action of the organism.

The cercaricidal action of normal serums, J. T. CULBERTSON (*Jour. Parasitol., 22 (1936), No. 2, pp. 111–125*).—A description is given of the antagonistic action of the normal serum of vertebrates against larval trematodes (cercariae), which action is manifested by the serum of representatives of all classes of vertebrates. "A considerable number of species of cercariae belonging to different groups have been tested and found susceptible to the cercaricidal action of the normal serums. The substance in the serum responsible for the cercaricidal effect is highly labile, being readily destroyed by heat or by desiccation and quickly lost in storage. It can be removed from the serum by absorption with a dry mass of either cercariae or bacteria. The alexin of the fresh serum is fixed during the process of absorption of the cercaricidal power by these substances. Agencies which destroy specifically the several known components of alexin also destroy at the same time the cercaricidal power of the serum.

"It is possible that with further work the test for cercaricidal action of serum may aid in determining potential hosts of cercariae in trematode life histories. The relationship of the cercaricidal action to some other antagonistic properties of serum and the limited possibility of its development as a response to specific immunization are briefly discussed."

Granulomatous nasal swelling in a bovine, C. L. DAVIS and H. L. SHORTEN (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 1, pp. 91–96, figs. 4*).—This is a case

report of a 10-year-old Hereford cow, born and raised in Colorado under semi-range conditions, from which a species of *Helminthosporium* was isolated.

Transmission experiments with bovine malignant catarrh, R. DAUBNEY and J. R. HUDSON (*Jour. Compar. Path. and Ther., 49 (1936), No. 1, pp. 63–89, pl. 1, figs. 5*).—An account is given of transmission experiments with strains of malignant catarrh or snotsiekte from Kenya. Two strains, at least, proved to be transmissible.

Further investigations on the causal agent of bovine pleuropneumonia, F. F. TANG, H. WEI, and J. EDGAR (*Jour. Path. and Bact., 42 (1936), No. 1, pp. 45–51, pls. 2*).—In continuation of their earlier work (E. S. R., 73, p. 386), the authors present descriptions of two rare morphological elements of the bovine pleuropneumonia organism, namely, the ameboid and the giant ring forms. The organism was found to be resistant to ultraviolet rays and to the photodynamic action of methylene blue. It has been cultivated in the chorioallantoic membrane of chicken embryo. No inclusion bodies were found, but the organism could be reisolated. Pseudopleuropneumonia forms have been found in chicken embryos and in the blood of the hen, guinea pig, rabbit, goat, sheep, horse, and man, and are thought to be formed from the protoplasm of red blood corpuscles by some process of protein dispersion.

Cattle plague vaccine: Studies on glycerinised spleen pulp, S. C. J. BENNETT (*Jour. Compar. Path. and Ther., 49 (1936), No. 1, pp. 1–48*).—Studies of rinderpest vaccine are presented, with a list of 35 references to the literature.

The appearance of Trichomonas foetus, the cause of trichomonad abortion, in cattle in the Netherlands [trans. title], L. DE BLIECK and A. BOS (*Tijdschr. Diergeneesk., 63 (1936), No. 7, pp. 369–373; Ger. abs., p. 373*).—The authors record cases of pyometra in cattle in the Netherlands due to *T. foetus*.

Border pining in sheep, II, W. L. STEWART and A. P. PONSFORD (*Jour. Compar. Path. and Ther., 49 (1936), No. 1, pp. 49–62, fig. 1*).—This contribution reports upon further studies (E. S. R., 74, p. 544) in which nematode parasites of the subfamily Trichostrongylineae are shown to be the apparent cause of the main symptoms of acute pining, although the number of parasites present during the winter months are insufficient to account for the persistent anemia and emaciation characteristic of chronic pining. It is suggested that border pining is due to a combination or interaction of malnutrition and gastrointestinal parasitic infestation.

A note on the subject of Johne's disease in sheep [trans. title], THIERY and GETAS (*Bul. Acad. Vet. France, 8 (1935), No. 4, pp. 210–212; abs. in Vet. Rec., 16 (1936), No. 8, pp. 219, 220*).—In tests made of 107 head in a flock of sheep, in which 10 ewes had died from Johne's disease, 23 gave positive, 15 doubtful, and 69 negative reactions to johnin. In a second lot of 60 head tested, 22 gave positive reactions, 3 were doubtful, and 35 negative. Reference is made to records of occasional outbreaks of this disease in sheep in various countries since 1911.

Chronic progressive pneumonia of sheep, with particular reference to its etiology and transmission, G. T. CREECH and W. S. GOCHENOUR (*Jour. Agr. Res.* [*U. S.*], *52 (1936), No. 9, pp. 667–679, figs. 6*).—This is a report of work on the etiology and transmission of a fatal lung disease of sheep which has been recognized among the herds of the northwestern United States, especially in Montana, where it has been studied by Marsh and Cowdry at the Montana Experiment Station (E. S. R., 50, p. 481; 57, p. 673), and in Oregon, for at least two decades.

In the authors' investigations of the disease 23 naturally infected and 96 healthy sheep were used, the latter being experimentally exposed. A number

of the lung specimens from natural cases of the disease were cultured with negative results, whereas others yielded different types of organisms, none of which proved to be an etiological factor. The lesions of the disease are of the nature of a chronic catarrhal pneumonia. Only 4 of the 96 experimentally exposed sheep developed lesions similar in character to those seen in natural cases of chronic progressive pneumonia, which, in the opinion of the authors, were the result of experimental exposure. Definite evidence to this effect was lacking, however, because of the inability to reproduce similar lesions by further inoculations of diseased lung tissues from these 4 animals into other healthy sheep. The studies have failed to reveal any specific etiological factor of a bacterial nature or otherwise.

Note on the egg producing capacity of Cooperia curticei, a nematode parasitic in sheep, J. S. ANDREWS (*Jour. Parasitol., 22 (1936), No. 2, pp. 222, 223*).—A series of observations on the number of eggs laid in a 24-hr. period by a single female *C. curticei* are briefly referred to. The results show that there was a considerable difference between the number of eggs produced per female in the case of 1 of 3 animals which harbored only 286 female *C. curticei* and the number of eggs produced per female in 2 other animals which harbored, respectively, 4,137 and 3,832 female *C.* curticei. It is pointed out that this result is in line with the findings of other authors that the egg production per female decreases as the number of parasites increases.

The occurrence of Eperythrozoon ovis in Algeria [trans. title], A. DONATIEN and F. LESTOQUARD (*Bul. Soc. Path. Exot., 28 (1935), pp. 423–426; abs. in Vet. Bul., 6 (1936), No. 1, pp. 27, 28*).—In investigations of the characters of a strain of *E. ovis* discovered in a sheep in Algeria, sheep and goats were inoculated. This was followed in the sheep by a brief invasion of the blood and in the goats by a heavy blood invasion which persisted in some animals for several months but without any rise in temperature. The persistence of the parasites was revealed by splenectomy or by the relapses which occurred with superimposed infections, such as anaplasmosis. The organisms occurred in the red blood corpuscles or free in the plasma, and they appeared as dots about 0.25μ to 0.33μ in diameter, staining a pale pink with Giemsa.

The occurrence of Eperythrozoon ovis in France [trans. title], H. LAFENÊTRE (*Rev. Vét. [Toulouse], 88 (1936), Apr., pp. 200, 201*).—The hematozoal parasite of sheep *E. ovis*, closely related to *Anaplasma*, which was described and first reported by Neitz et al. (E. S. R., 73, p. 239) in 1934 from the Union of South Africa and discovered by Donatien and Lestoquard in Algerian sheep as above noted, is recorded for the first time in sheep in the south of France. The pathogenicity of the form occurring in France remains to be determined.

Tapeworm studies.—III, Sheep parasitized with one Moniezia expansa each, N. R. STOLL (*Jour. Parasitol., 22 (1936), No. 2, pp. 161–179, figs. 2*).—In this further contribution (E. S. R., 74, p. 545) two sheep, each harboring one *M. expansa*, were studied primarily with reference to the development and maintenance of the cestode infections. "Parasitism resulted from exposure to infested ground for 7⅛ hr. in November and 8 hr. in January, respectively. In the first case a prepatent period of 37 days was followed by a patent period of 54 days, although proglottids had ceased appearing 2 days earlier. Six days after the end of the patent period a single specimen of *M. expansa*, intact with scolex but not showing mature segments, was recovered at the autopsy of the host. A definite cycle of proglottid production was observed. It was high at the beginning of patency, then dropped sharply, and gradually rose again to about the original level before finally tapering off. The basis is given for the estimate of a total production during the patent period of about 4,000 proglottids

and between 40 and 80 million eggs. Mature segments totaling about 6 m were discharged. In the second case, not followed in such detail as the first, there was indicated a similar prepatent period, followed by a patent period of 7 weeks, an interpatent period of a week, and a period of renewed patency until slaughter of the host 4 weeks later, when one mature *M. expansa* was found."

A report on experimental infections of Ovis aries with the infective larvae of Ostertagia circumcincta, W. L. THRELKELD and T. O. DOWNING (*Jour. Parasitol., 22 (1936), No. 2, pp. 187–201, figs. 6*).—Experiments conducted at the Virginia Experiment Station with a view to determining the pathogenicity of the infective larvae of *O. circumcincta* on the host, with particular reference to the blood, are reported.

Light infections with *O. circumcincta* larvae (4,395–27,700) given over periods of from 2 weeks to 2 mo. 9 days to 3 lambs 4, 6, and 1 mo. old, respectively, apparently caused no injury to the host. Moderate numbers of larvae (46,685) given over a period of 4 mo. to a lamb 5 mo. old, caused no pathologic symptoms other than a loss in weight. Moderate numbers of larvae (55,000) given over a short period of time (1 week) to a lamb 7 mo. old produced a slight eosinophilia of a short duration. Large numbers of larvae (225,000) given to a lamb 1 mo. old, over a period of 1 week, affected the growth of the host animal. There was a decrease in the percentage of hemoglobin. The differential blood count indicated a decrease in the percentage of lymphocytes, a pronounced eosinophilia, and the appearance of undifferentiated cells designated as hemocytoblasts; the latter probably are called forth as red-cell precursors to counteract the anemia. Very great numbers of larvae (1,145,000) given to a lamb 8 weeks old over a period of 2 mo. 18 days caused a loss of weight and produced pathologic changes with erythrocytosis, followed by a decrease in the red cells, as well as a drop in the hemoglobin percentage and the number of lymphocytes. Hemocytoblasts appeared at this time. Moderate doses of larvae (55,000) and heavy doses of larvae (225,000) given over a period of 1 week to 2 lambs 7 and 1 mo. old, respectively, yielded a comparatively heavy egg output over short duration, 28 days to 1 mo. 28 days, which rapidly reached a maximum and rapidly decreased to permanent negative counts. This was a marked contrast to the histories of egg count readings obtained from 3 lambs which received doses of infective larvae over extended periods.

An experimental study of rinderpest virus in goats in a series of 150 direct passages, P. T. SAUNDERS and RAO SAHIB K. KYLASAM AYYAR (*Indian Jour. Vet. Sci. and Anim. Husb., 6 (1936), No. 1, pp. 1–86, pl. 1, figs. 82*).—In experimental work the mortality rate from rinderpest in control animals gave evidence of attenuation of the virus for bovines after the eightieth passage through goats. There was a constancy of reaction in the experimental goats in Madras with no evidence of attenuation for these animals. All of the experimental goats readily took the infection, and there is no indication that the virus cannot be maintained indefinitely through goats.

Trembling in pigs, E. H. HUGHES and R. HINMAN (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 1, pp. 96, 97*).—A brief report is made of two litters of pigs farrowed in the California Experiment Station herd in the spring of 1936, individuals in which exhibited a marked trembling. The condition, the cause of which has not been determined, is considered to be the same as that reported from Pennsylvania by S. M. Nissley in 1932.[8]

Infection of the Rhesus monkey (Macaca mulatta) and the guinea-pig with the virus of equine encephalomyelitis, E. W. HURST (*Jour. Path. and Bact., 42 (1936), No. 1, pp. 271–302, figs. 2*).—In the author's investigations, con-

[8] Jour. Amer. Vet. Med. Assoc., 81 (1932), No. 4, p. 551.

ducted with both the western and eastern strains of equine encephalomyelitis virus, but more often the latter, it was found that the course of the infection in guinea pigs or *Rhesus* monkeys may be divided into visceral and nervous phases. "In the guinea pig the two phases tend to overlap, in the monkey to be separated by an interval of several days. The nervous phase succeeds the visceral much less constantly in the monkey than in the guinea pig.

"During the visceral phase virus circulates in the blood in greater amount than can be accounted for readily by its titer in the viscera, while at a site of innoculation in muscle little or no multiplication takes place and in the dermis only moderate local increase. It seems, therefore, that the virus must multiply chiefily either in the blood or in some tissue intimately connected with the blood stream and forming only a small part by weight of the various viscera.

"In the monkey, nervous infection occurs at a time when the very prompt antibody response to the visceral infection is as complete as it ever will be; monkeys recovered from the visceral infection without obvious nervous involvement are not usually immune to intracerebral inoculation of fresh virus. On the other hand, guinea pigs recovered without having shown nervous symptoms are immune to subsequent intracerebral inoculation.

"Unlike many neurotropic viruses, the virus of equine encephalomyelitis inoculated intramuscularly or intradermally does not reach the central nervous system by way of the local peripheral nerves. In many cases the findings suggest that the nervous system is infected by virus which has during the period of blood circulation passed out on to the nasal mucosa, and thence by the perineural lymphatics of the olfactory nerve to the subdural space. The evidence presented does not finally exclude on the part of the virus a slow 'growth through' the hematoencephalic barrier as an alternative method of infection of the central nervous system, but in the monkey virus does not pass directly from the blood into the cerebrospinal fluid.

"Argument is advanced to show the probable close resemblance of the virus of equine encephalomyelitis to certain other viruses capable of exciting nervous disease, viz, those of vesicular stomatitis, yellow fever, and louping ill. As a group these viruses probably possess 'pantropic' affinities, but as they differ materially in their cellular affinities and mode of action from such pantropic viruses as pseudorabies, B virus, and herpes, they must be relegated to a separate group."

Further studies on the efficacy of fowl-pox vaccines, A. KOMAROV and I. J. KLIGLER (*Jour. Compar. Path. and Ther., 49 (1936), No. 1, pp. 90–95*).—Laboratory and field experiments here reported are considered to warrant the conclusion that (1) "fowl pox vaccine applied by the stick method on the wing to flocks 2- to 3-mo. old, of early hatch, results in few secondary lesions and confers a durable immunity", and (2) "it is not advisable to use this vaccine in late-hatched birds because these birds suffer from severe postvaccination reactions." It is suggested tentatively that late hatches be first vaccinated with pigeon pox vaccine and 2 mo. later with fowl pox.

Studies of pullorum disease.—II, The incidence of Salmonella pullorum in eggs from infected hens, W. L. MALLMANN and J. M. MOORE (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 1, pp. 35–52, fig. 1*).—In continuation of studies of pullorum disease at the Michigan Experiment Station (E. S. R., 71, p. 103) infertile eggs from reacting hens contained less *S. pullorum* infection than the fertile eggs from the same hens. "A study of eggs from reacting hens reveals that both dead germs and chicks dead in the shell show a much higher incidence of *S. pullorum* than the live chicks from the same hens.

The average incidence of *S. pullorum* in all the eggs from reactor stock is nearer that of the organism in the fertile eggs, rather than the average obtained by checking the presence of *S. pullorum* in both the fertile and infertile eggs. The percentage of infection shown by chicks hatched from reactor stock is remarkably low. The extent of the disease in the chick is probably due not to the large number of infected chicks hatched but to the spread from a few infected chicks during hatching and brooding. Apparently pullorum disease is very contagious. The need of segregation of clean stock, the immediate elimination of infected chicks, and the use of clean incubators and brooders is clearly demonstrated by this study."

Arthritis in a chick caused by Salmonella pullorum, F. R. BEAUDETTE (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 1, pp. 89–91*).—This brief review of the literature, contributed from the New Jersey Experiment Stations, indicates that *S. pullorum* may be isolated, as a localized infection, from the ovary, testes, spleen, gall bladder, thoracic abscess, myocardium, pericardial sac, skin, middle ear, and the joint cavity.

Variation of Salmonella pullorum, H. VAN ROEKEL and L. F. RETTGER (*Jour. Infect. Diseases, 58 (1936), No. 2, pp. 172–184, figs. 7*).—This contribution reports upon the behavior of 13 variants detected among 163 freshly isolated strains of *S. pullorum* during the course of a study of the variation of this organism (E. S. R., 73, p. 854). "The behavior of these variants in sodium chloride solution of different concentrations and in the presence of positive and negative serums differed greatly. Other properties, such as colonial and cellular morphology, Gram-staining, and biochemical reactions revealed little or no variation, on the whole. *S. pullorum* strains readily underwent variation when subjected to frequent transfer and storage in beef infusion broth. When variants were cultivated on both meat extract agar and liver infusion agar the colonial and cellular features often appeared markedly different. Some strains that appeared normal on meat extract agar exhibited pleomorphic tendencies when placed on liver infusion agar Most variants exhibited a lesser degree of virulence than their parent strains, and in some instances appeared avirulent. The agglutinogenic power and the absorptive capacity of the variants tested were not equal to those of the normal type."

The resistance of Salmonella pullorum to the action of various disinfectants, E. C. MCCULLOCH and S. COSTIGAN (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 1, pp. 53–58*).—The results of tests made of the viability of *S. pullorum* in chicken manure suspensions and the disinfection of *S. pullorum* with phenol, liquor cresolis, formaldehyde, sodium hypochlorite, and lye are reported in table form.

The results show that the disinfectants may be divided into two classes. The phenol, the liquor cresolis, and the formaldehyde are markedly affected by the temperature, while the sodium hypochlorite and the lye are but slightly influenced. On the basis of the concentration required to kill in 10 min. but not in 5, in the absence of added organic matter and at 2° C., phenol killed *S. pullorum* in a dilution of 1:50, liquor cresolis in 1:65, formaldehyde in 1:25, sodium hyperchlorite 70 p. p. m. of available chlorine, and lye in 1:1,175.

The addition of chicken manure only slightly influenced the results; in the presence of light and heavy chicken manure suspensions at 2°, the mean phenol coefficients are as follows: Liquor cresolis 1.35, formaldehyde 0.45, available chlorine 333, and lye 15.75.

"At 20°, in the absence of added organic matter, phenol killed *S. pullorum* in 1:80, liquor cresolis in 1:125, formaldehyde in 1:50, sodium hypochlorite

in a concentration of 50 p. p. m. of available chlorine, and lye in 1:1,250. In the presence of the heavy suspension of chicken manure, lye killed in 1:750. At this temperature the mean phenol coefficients are liquor cresolis 1.77, formaldehyde 0.71, available chlorine 250, and lye 12.5.

"At 40° a 1:175 phenol dilution and a 1:400 liquor cresolis dilution killed *S. pullorum* in the absence of chicken manure, while a 1:350 dilution killed when it was present; formaldehyde (1:200) killed in the absence of chicken manure, and a 1:150 dilution killed when it was present; sodium hypochlorite (40 p. p. m.) killed; and lye killed in dilutions of 1:1,250 to 1:1,500. The mean phenol coefficients at 40° are liquor cresolis 2.1, formaldehyde 1, available chlorine 143, and lye 7.6."

The cellular elements and hemoglobin in the blood of chickens with spontaneous tuberculosis, C. OLSON, JR., and W. H. FELDMAN (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 1, pp. 26–34*).—A report is made of a study of the blood of eight female Rhode Island Red fowl 2 to 3 yr. old which had reacted positively to intradermal injections of avian tuberculin. One failed to give macroscopic or microscopic evidence of the disease at necropsy and also presented essentially normal hematologic findings. The seven tuberculous birds revealed leucocytosis, especially in regard to the heterophile granulocytes and monocytes. The degree of leucocytosis was about in direct ratio with the extent of the tuberculosis. In none of the tuberculous fowls studied was there any indication of anemia. Attempts to obtain cultures of the avian type of the organism in the circulatory blood failed in all but one instance.

An outbreak of aegyptianellosis in Pekin ducks, J. D. W. A. COLES (*Jour. So. African Vet. Med. Assoc., 5 (1934), No. 2, p. 131*).—The occurrence of the parasite *Aegyptianella pullorum* in a diseased 2-month-old Peking duck in a flock at Pretoria North, Union of South Africa, in which 10 were affected, is reported. The presence of the disease in chickens on the same farm is said to have been detected by the author the preceding year.

Paratyphoid infection in turkeys, C. D. LEE, G. HOLM, and C. MURRAY (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 1, pp. 65–76*).—A paratyphoid organism was isolated from turkey poults of various ages under 5 weeks from farms in widely distributed areas in Iowa, where large losses were experienced by the owners in 1934. The incidence of occurrence on the same farms was low the second year.

"A general systematic study of the organism, including the application of the simple agglutination test as well as the agglutinin absorption test, identified the organism as *Salmonella aertrycke* type. The organism is highly virulent for baby chicks, young poults, guinea pigs, and rabbits when administered orally, intraperitoneally, or intravenously. Newly hatched poults may spread the infection to others. The cycle of infection seems to be very similar to *S. pullorum* infection in chickens. The symptoms are weakness, unthriftiness, loss of appetite, ruffling of feathers, dragging of wings, sleepiness, diarrhea, sudden onset, and high mortality. The lesions of the disease in turkey poults may be said to be duodenitis, hyperemia of the liver and kidneys, hyperplasia of bone marrow of the long bones, a distention and filling of the ceca with a cheesy, coagulated plug of fecal material, undigested feed material, and epithelial debris. The blood picture presents a leucocytosis with a large degree of monocytosis."

Species of Capillaria parasitic in the upper digestive tract of birds, E. B. CRAM (*U. S. Dept. Agr., Tech. Bul. 516 (1936), pp. 28, figs. 12*).—The status of the present knowledge of 11 species of nematodes of the genus *Capillaria* occurring in parts of the digestive tract of birds anterior to the intestines is considered.

The species *C. charadrii* (Rudolphi 1819) Travassos 1915 is said to be nomen nudum and therefore unrecognizable. A morphological description is given of each of the other 10 species, namely, *C. annulata* (Molin 1858) Cram 1926, *C. contorta* (Creplin 1839) Travassos 1915, *C. corvicula* (Wassilkowa 1930) Baylis 1931, *C. cylindrica* (Eberth 1863) Travassos 1915, *C. dispar* (Dujardin 1845) Travassos 1915, *C. laricola* (Wassilkowa 1930) Baylis 1931, *C. lophortygis* Baylis 1934, *C. obtusiuscula* (Rudolphi 1819) Travassos 1915, *C. perforans* Kotlán and Orosz 1931, and *C. triloba* (Linstow 1875) Travassos 1915.

The author concludes that external characters rather than an internal character, such as the spicule, are of primary importance in the recognition of *C. contorta*, and on that basis has allocated as that species a capillarid found by her in the esophagus, including the crop, of a considerable number of gallinaceous and a few anseriform birds. It is pointed out that the present descriptions of two recently created species, *C. lophortygis* and *C. perforans*, are inadequate for satisfactory differentiation of them from *C. contorta*.

"Three species, namely, *C. annulata*, *C. contorta*, and *C. dispar*, are known to produce severe pathological effects, which are described. Of these species, the first two have appeared to be of increasing economic importance in poultry and game birds in the United States during the past decade. Attempts to produce artificial infestations with *C. annulata* were unsuccessful, but experimental proof of the complete life cycle of *C. contorta* was obtained. . . .

"Six turkeys and two bobwhite quail were experimentally infected in such well-controlled experiments that no doubt existed as to the origin of the parasites; the cultures used for these experiments included strains of *C. contorta* from the bobwhite quail, mountain quail, ring-necked pheasant, and turkey. In addition, specimens of *C. contorta* from a domestic duck, a young Peking, were thought to have developed as a result of an artificial feeding with a culture of the pheasant strain, although the presence of a few specimens of the parasite in a control duck raised the question as to the origin of the infestations. Later attempts to infect ducks were unsuccessful, possibly due to the age or race of the birds used; negative results were obtained also in several cases with turkeys. Only negative results followed repeated attempts to infect chickens, guinea fowls, and pigeons, and a single attempt to infect a crow."

A list is given of 52 references to the literature cited.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Idaho Station], H. BEERSFORD (*Idaho Sta. Bul. 220 (1936), pp. 12–16, 28, 29, fig. 1*).—The progress results are briefly presented of investigations on drainage effect of wells; new types of farm machinery, including the small-size, high-speed, all-crop combine, and plow attachments for pea weevil control; production of alcohol from potatoes; power and labor utilization in Idaho creameries; dairy barn ventilation; rural electrification, including supplementary electric heat in poultry laying houses, and the use of electric fences; and the distribution and costs of steam, electrical power, and labor in Idaho creameries.

[Agricultural engineering investigations by the Michigan Station], H. H. MUSSELMAN (*Michigan Sta. Rpt. 1935, p. 158*).—A very brief progress report is presented of investigations on bindweed control equipment, porous canvas hose irrigation, and low-pressure tires on tractors.

[Agricultural engineering investigations by the Montana Station] (*Montana Sta. Rpt. 1934, pp. 45–48*).—The progress results are briefly presented of investigations on the storage and use of flood waters for irrigation, water wheels and pumps for irrigation, and irrigation methods.

[Terracing and water and sewage investigations by the New Jersey Stations] (*New Jersey Stas. Rpt. 1935, pp. 12–14, 89–94*).—The progress results of investigations are briefly presented on terracing, activated sludge, sewage chlorination, chemical precipitation of sewage, sewage sludge dewatering, use of activated carbon in sewage treatment, pathogenic organisms in sewage, and high and low temperature digestion of sewage.

[Agricultural engineering investigations by the South Dakota Station], R. L. PATTY (*South Dakota Sta. Rpt. 1935, pp. 8–11, 45*).—The progress results are briefly presented of investigations on field machinery hitches for tractors and large horse teams, rammed earth for farm building walls, corn harvesting machinery, protective coverings and length of service of steel fence posts, and rammed earth walls in poultry house construction.

American Farm Bureau Federation, Institute of Irrigation Agriculture, Fourth Water Users Conference, Los Angeles, Feb. 25–27, 1935 ([*Chicago: Amer. Farm Bur. Fed., 1935*], *pp.* [*3*]+*99, pl. 1*).—This institute included, among others, special papers on Underground Water, by H. Conkling; The Use of Power on Irrigation Projects, by C. L. Childers; Underground Water, by J. J. Deuel; Measures Taken to Alleviate the Effects of the Drought of 1934, by W. W. McLaughlin; and The Movement and Control of Underground Water, by W. Peterson.

American Society of Civil Engineers, Report on Progress Conference on Water Conservation, Los Angeles, Mar. 13, 14, 1935 ([*Los Angeles: Amer. Soc. Civ. Engin.*], *1935, pp.* [*3*]+*102*).—This report, presented by the committee on conservation of water of the irrigation division of the American Society of Civil Engineers, contains special papers and reports on Evaporation Studies in Southern California, by H. F. Blaney and A. A. Young; Use of a Limited Water Supply for Irrigating Citrus Orchards, by C. A. Taylor; Law of Underground Waters, by H. Conkling; Economic Limits of Conservation of Flood Water by Spreading, by K. Q. Volk; Runoff From Small Experimental Plots, by F. B. Laverty; Measurement of Debris Transported from Burned Areas, by C. W. Sopp; Check Dams, by P. Bauman; Erosion Control, by H. E. Reddick; Forest Influence Studies at the San Dimas Experimental Forest, by E. I. Kotok; Safeguards on Denuded Watersheds, by W. V. Mendenhall; Runoff and Erosion Experiments in Mountain Areas, by C. J. Kraebel; and Erosion and Runoff Experiments from Cultivated Areas, by L. A. Jones.

American Farm Bureau Federation, Institute of Irrigation Agriculture, Fifth Annual Conference, Salt Lake City, Mar. 11–13, 1936 ([*Chicago: Amer. Farm Bur. Fed., 1936*], *pp.* [*4*]+*82*+*16*).—This institute included, among others, special papers on Basic Information Relating to Hydrology of the Region West of the 100th Meridian, Including a Study of Methods and Results of Snow Surveys, by G. D. Clyde; How the Great Plains Area is Meeting the Problems of Irrigation Pumping, by G. S. Knapp; A Committee Report of Recent Research and Investigational Work on Irrigation and Drainage in the Western States, by W. W. McLaughlin, C. S. Scofield, and O. W. Israelson; Practical Irrigation Problems on Which Farmers Need Assistance, by W. Peterson; A Study of the Preferential Rights in the Use of Water and Their Relation to Agriculture and of Authority for Enforcement, by G. E. P. Smith; A Critical Study of the Recommendations of the National Resources Board, by R. B. West; and The Place of Reclamation in the National Agricultural Program, by M. L. Wilson.

Experimental verification of pump well theories, T. R. COLLIER and W. GARDNER (*Utah Acad. Sci., Arts, and Letters, Proc., 12 (1934–35), pp. 177–179, figs. 2*).—In a brief contribution from the Utah Experiment Station an attempt

is made to verify experimentally the conclusions of Eliason and Gardner reported in a previous article (E. S. R., 69, p. 437).

Partial list of Government publications of interest to architects, builders, and retail lumbermen (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab., 1936, pp. 16*).—This mimeographed list relates mainly to fungus defects in forest products; the growth, structure, and identification of wood: manufacture and grading of lumber; mechanical properties and structural uses of wood and wood products; the seasoning of wood; wood finishing subjects; and wood preservation.

The relation of colloids in soil to its favorable use in pisé or rammed earth walls, R. L. PATTY (*South Dakota Sta. Bul. 298 (1936), pp. 23, figs. 13*).—This bulletin summarizes results of studies in progress at the station for several years on rammed earth as a structural material and refers particularly to recent studies on the soil colloid relationships.

It has been found that a soil low in colloids is favorable for pisé walls and resists weathering action well. A soil that tests high in colloids is unfavorable for the purpose. A test for colloids not only identifies the soil as being favorable or unfavorable, but indicates just how favorable it will be.

The hydrometer method of soil analysis was found to lend itself well to work with earth walls. With this method the colloidal content of a soil can be obtained in 40 min. after the sample has been dried to constant weight. Heavy clay soils high in colloids were found to be unfavorable for rammed earth walls, while light sandy soils low in colloids were very favorable. The dividing line was found to be a colloidal content of 40 percent. Soils containing more than 40 percent colloids are not fit to use as they are, and in few cases can such soils be made satisfactory for the purpose by adding a reasonable amount of sand or by special protective coverings.

Silt seems to be more favorable in a soil than clay. Although no uniform ratio is shown between the silt content and the quality of the wall, it is apparent that silt is generally favorable. It is also true that a silty soil makes an excellent wall when sand is artificially added.

Sand is distinctly favorable in a soil for pisé work. Sandy soil resists weathering, rams much more quickly, holds protective coverings well, and probably will hold oil paints. It was found that no soil containing less than 80 percent sand is too sandy for the purpose.

Additional findings since a previous account (E. S. R., 70, p. 260) are given. Foundations for pisé walls should extend from 12 to 15 in. above the ground except in cases in which cement stuccoes are used for coverings, in which case 9 in. may be sufficient. Rammed earth increases in strength with age in the same way as does concrete. The average increase in strength was 45 percent over a period of 2 yr.

Age-strength relationship for rammed earth, R. L. PATTY (*Engin. News-Rec., 117 (1936), No. 2, p. 44, figs. 2*).—In tests conducted at the South Dakota Experiment Station on the relation of age to the strength of rammed earth, three base soils were used and 12 test blocks were made from each soil on the same day and from the same pile of earth. The first was a very heavy clay soil, the second a medium sandy soil, and the third a very sandy soil. At the end of 6 mo. four blocks of each soil were tested to failure, at the end of 1 yr. four other blocks of each of the soils were broken, and at the end of 2 yr. the final four blocks of each soil were broken. Upon averaging the strength of each group of test blocks an increase in strength was shown in the case of each soil. At the end of 1 yr. the average increase in strength over the 6-mo. test blocks was 33.7 percent, and at the end of 2 yr. the average increase in strength over the 6-mo. blocks was 45 percent.

The heavy clay soil had the greatest early strength, and it was still first in strength at the end of 2 yr., but the results showed that the sandier soils gained more strength with age. Clay soil is not a favorable soil for pisé walls in spite of its superior strength, because it has a tendency to slake in the wall and does not resist the action of weathering as well as the soils containing less clay. Of the three soils used in this strength test, soil containing 74.82 percent of sand made the best wall.

Hardwoods of the South (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab., 1935, pp. 16, figs. 14*).—Southern hardwoods are discussed briefly with reference to texture, planing, shaping, turning, bending, warping, cross grain, seasoning, splitting, nail holding, screw holding, gluing, and odor and taste.

Operating small sawmills, methods, bibliography, and sources of equipment, C. J. TELFORD (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab., 1936, pp.* [2]+*40*).—This is a technical treatise on financing and operation of logging and milling outfits, with information on timber appraisal and marketing. A list of manufacturers of dry kilns, sawmills, and accessories in the United States is included.

The measurement of the flow of air through timber seasoning stacks, W. L. GREENHILL (*Jour. Council Sci. and Indus. Res.* [*Austral.*], *9 (1936), No. 2, pp. 128–134, figs. 4*).—A method of measuring the air velocity through timber stacks by means of a vane anemometer is described. Correction factors, which, for any particular type of anemometer, were found to depend on the thickness of the timber and of the separating strips, on the velocity of the air, and on the position in which the anemometer is held, have been determined for a number of cases.

Tests on the strength of beams notched in various ways, I. LANGLANDS (*Jour. Council Sci. and Indus. Res.* [*Austral.*], *9 (1936), No. 2, pp. 88–96, figs. 2*).—Three series of tests on long and short beams of Australian timber are reported, one on 4- by 2-in. specimens designed to fail in shear even when not notched and the others on 4- by 2-in. and 3- by 2-in. specimens of such length that they would normally fail in bending.

It was found that notching the ends of beams and joists seriously affects their strength. It is therefore advisable not to notch the ends of a joint or beam whenever it can be avoided. The reduction in strength can be obtained with fair accuracy from the U. S. D. A. Forest Service formula. If it is necessary to notch the beam its strength can be about doubled (or under certain conditions even brought up to the strength of an unnotched beam) by cutting away the bottom portion of the beam at the notch by means of a slanting saw cut with a slope of about 1 in 3 to the axis of the beam.

Load performance tests of precast joist-precast slab floor construction, R. E. COPELAND (*Jour. Amer. Concrete Inst., 7 (1935), No. 2, pp. 195–211, figs. 9*).—The tests reported were conducted on a type of light weight concrete floor constructed of precast reinforced concrete slab sections laid on and united to precast reinforced concrete joists. Seventeen large panels were tested, all of 14-ft. clear span except one of 20-ft. span. All panels were tested with uniformly distributed load except one panel where the load was applied at the midspan and quarter points.

The loads placed on the panels ranged from 40 lb. per square foot for the panels having the weakest bond joints to 445 lb. per square foot. Yield point stress in the tension steel was produced by a load of 200 lb. per square foot in the case of the panel with joists functioning as independent members and by loads of from 275 to 288 lb. per square foot in the case of 14-ft. span panels functioning as a T-section.

The deflections due to the weight of the slabs averaged about 0.12 in. for the 14-ft. panels and 0.2 in. for the 20-ft. panel.

The plain bond joint, type 1, whose shear resistance depends wholly on the adhesion of the mortar to the precast members, failed with panel loads of 40 lb. per square foot with smooth textured mortar contact surfaces, and with panel loads of from 40 to 160 lb. per square foot with rough textured mortar contact surfaces. Joint types 2 and 3, providing for a mechanical bond by interlocking the slab units with the joist, performed very satisfactorily and were relatively stronger in panel load capacity than the tension reinforcement. In joint types 4 and 5, in which mechanical bond was obtained by means of the irregular or serrated mortar contact surfaces forming a series of small mortar keys, joint type 4 fractured at a load of 220 lb. per square foot and joint type 5 at a load of 218 lb.

The results in general are taken to indicate that it is possible and practicable to construct precast joist-precast slab floors in such a manner that the joist and slab function together as a T-section.

Considering the range of mortar strengths studied, strength of mortar was not an important factor, but it is believed that the mortar should be at least as strong as the 1:1:6 cement-lime mortar used. Panels constructed of Haydite concrete performed similarly to comparison panels made of sand and gravel concrete. Within the range of conditions studied, variations of span length and type of loading produced no appreciable effect on load performance.

One hour fire test of fire-retardant wood door, A. S. WILLIAMS (*Amer. Wood-Preservers' Assoc. Proc., 31 (1935), pp. 225–229, figs. 3*).—In this experiment the test assembly consisted of a flush-type wood door 1¾ in. thick, 36 in. wide, and 79¾ in. high. The door was composed of a fire-retardant wood core constructed of chestnut strips approximately 1⅜ in. wide, assembled so as to form two 5-in. stiles, running the full length of the door and joined by four 10-in. cross rails, thus providing for three panels 13¼ by 26 in., which in turn were divided at the middle by means of a 5-in. short stile joined to the cross rails. The rails were joined to the stiles by tongue-and-groove joints supported by dowels. The core thus assembled was covered with a ⅛-in. cross band of fire-retardant poplar, and the door was finished with ⅛-in. untreated birch veneer. The door was hung with ⅛-in. clearances at top and sides and ⅛ in. at bottom. The test structure consisted of a gas-fired furnace having an opening 62 by 93 in., which formed one wall of a vestibule with the test assembly in place.

The test was conducted in accordance with the procedure outlined in the Standard Fire-Test Specification C 19–33 of the American Society for Testing Materials. The temperature rise on the unexposed face of the door was 176° F. above the initial vestibule temperature. The door showed practically no deformation at the end of the test and remained secure in the frame. The unexposed face of the door showed no discoloration, and at no time did flame appear on the unexposed face. No smoke was evolved by the test assembly, and only a small amount of smoke passed through the openings when the furnace damper was closed near the beginning of the test.

Corrosion: Causes and prevention, F. N. SPELLER (*New York and London: McGraw-Hill Book Co., 1935, 2. ed., pp. XIII+694, figs. 141*).—This is the second edition of this book. It deals with the nature and mechanism of corrosion: principles and methods of corrosion testing; relative corrosion of ferrous metals; prevention of corrosion in the atmosphere, under water, in closed water systems by removal of dissolved gases, in high-pressure steam plants—boiler water treatment, in steam and hot water heating systems, in chemical

industries, and underground; and stray-current electrolysis. The book also contains an appendix on the calculation of corrosion rates in terms of penetration in inches per year, the marble test of Von Heyer, determination of sodium sulfite, and retarding corrosion in refrigerating plants and a selected bibliography on the corrosion of ferrous metals.

Studies on the use of the terracing plow for soil conservation, H. J. HARPER (*Jour. Amer. Soc. Agron., 28 (1936), No. 4, pp. 301–309, figs. 3*).—Studies at the Oklahoma Experiment Station on the terracing plow are reported, the purpose of which was to determine its limitations in a soil conservation program.

It was found that the effective height of terrace ridges could be increased by plowing twice in the same furrow for three or four rounds. When a riding plow is used a deep narrow furrow slice should be moved toward the terrace ridge. A moldboard designed with the outer end flattened and bent slightly to the rear at a point about 22 in. from the edge of the landside will operate easier along crooked furrows in soil where sods are frequently encountered and in soil which tends to stick near the end of a straight moldboard.

The draft of a terracing plow is very similar to that of a general-purpose plow when operating under similar conditions. A plow operating in subsurface soil required about twice as much power as the same plow operating in surface soil. When terrace ridges are being constructed with a terracing plow the land should be planted to small grain or some other crop which will cover the surface of the ground and reduce the erosion which may occur from breaks in the low ridges, unless the ridges can be plowed two or three times during the fall or winter in order to increase the effective height. When row crops are grown the rows should be planted on a contour and parallel with the terrace ridge. The terracing plow was more useful that a backfilling plow or an ordinary plow in gully control work where soil is removed from the upper edge of a bank in order to establish a more vigorous growth of vegetation in the bottom of the ditch.

The combine harvester, E. G. GREST (*Sci. Agr., 15 (1934), No. 4, pp. 244–246*).—In a brief contribution from the Canadian Department of Agriculture, an analysis of data relating to combine harvester cost is presented for 63 machines. It was found that in most cases 700 acres or more for a 15–16 ft. combine and 525 acres or more for a 10–12 ft. combine must be harvested per year to obtain a reasonable cost per acre of crop harvested.

Small-grain nursery equipment, H. M. BROWN and J. W. THAYER, JR. (*Jour. Amer. Soc. Agron., 28 (1936), No. 5, pp. 395–403, figs. 8*).—The five machines developed at the Michigan Experiment Station and in use on the plant breeding plats include a planter, a garden tractor grain nursery cutter, a bagger, a tier, and a nursery thresher.

Gardening by electricity, "TRICIAN" (*Rural Electrif. and Electro-Farming, 11 (1936), No. 133, pp. 407–409, figs. 3*).—Applications of electricity to small-scale gardening operations in England are briefly described.

Electricity in poultry farming, C. A. CAMERON BROWN (*Oxford: Univ. Oxford Inst. Res. Agr. Engin., 1935, pp. 73, pls. 12*).—This is a conservative analysis of data relating to the uses of electricity on poultry farms in England, as gathered from a survey of the experiences of a large number of farmers in different parts of the country and as obtained from the work of various research institutions.

It is concluded that the use of electrical methods in poultry farming has become technically successful. The fear of current failure appears to be the biggest single objection to the general adoption of electrical methods where the cost is favorable.

With reference to the cost of running, all-electric incubators using current at 1.25d. per unit compare favorably with oil-heated machines, bearing in mind the extra labor and the wastage with oil. At 1d. per unit the all-electric incubator is as cheap as oil under average conditions on all grounds, and at prices less than 1d. the all-electric machine is cheaper. While the economic results are best in the bigger cabinet machines, the use of electricty in the smaller and in the table machines is particularly appreciated in districts where poultry farming is incidental to mixed farming.

For rearing, electricity cannot compete with oil- or coal-fired, central-heated, hot-water plants on large farms, but it is better than oil for battery brooding and the cost is reasonable at unit prices up to 1.25d. or so. For hover heating it is competitive with oil at the same price per unit only if great care is taken in operating the controls or if automatic control is fitted, and a rate of from 0.5 to 0.75d. per unit is necessary to allow hover heating to be developed to any extent.

Lighting of laying houses is successful, but the costs determined in tests should be related to prevailing market prices. The application showed a substantial profit per bird in the conditions experienced during the 1930–31 season.

With reference to the quality of output the electrical methods are criticized in some quarters on the grounds of producing poorer and less virile birds. This does not appear to be true in connection with rearing, compared at least with other methods of heating, but in hatching there is definitely a tendency to hatch out the less virile chicks which would otherwise have failed to survive. The remedy is drastic inspection and culling, and this illustrates that the use of these modern methods is only for the experienced poultryman who knows both how to appreciate the labor-saving devices and to recognize their limitations. Doubts may exist as to the reliability of the supply, but there is no doubt that operation with electrical appliances is more convenient and pleasant than with any other type.

A "two-way" candling and grading bench for use in egg packing plants, E. R. MENEFEE (*Poultry Sci., 15 (1936), No. 2, pp. 125, 126, fig. 1*).—In a brief contribution from the Indiana Experiment Station, a description is given of a grading and candling device which is used in several Indiana packing plants where eggs are being graded under the U. S. Government standards.

Air conditioning by the sun, W. P. GREEN (*Mech. Engin. [New York], 58 (1936), No. 6, pp. 369–371*).—Studies conducted at the University of Florida on the possibility of using solar energy for air conditioning in Florida are briefly reported.

In order to secure definite information as to how much heat can be expected from a square foot of Florida sunlighted area, a parabolic-trough or cylinder-type heater was built and mounted upon the roof of the engineering shops at the university. The reflector has a length of 3 ft. and a width of 4 ft. and is enclosed in a sheet metal case insulated inside with a single thickness of celotex. The reflector material is a thin sheet of nickel-plated zinc. The top of the reflector case is covered with ordinary window glass. The collector is turned about an axis, parallel to the earth's axis of rotation, by a system of weights and is so timed by two alarm clock motors as to be facing the sun continually. At the focus of the reflector inside its case there is a 2-in. round iron pipe which has inside of it a 1.25-in. pipe. Water circulates by gravity between the two pipes and is heated by the sun's rays which the reflector concentrates upon the pipe. Provision is made for measuring the quantity of water circulating and the temperature rise.

Results obtained during runs in November, 1934 and 1935, showed as high as 128 B. t. u. per square foot per hour of sunshine collected was possible with

this simple type of construction. Radiation losses being less will tend to increase this value during the summer, although the increase in the humidity of the air during the summer cuts down the atmospheric transmission of solar energy. Operating temperatures as high as 220° F. were readily obtainable, the aforementioned test being run at 210°. When filled with water and with all outlets closed, the steam pressure rose to 50 lb. per square-inch-gage, indicating a temperature in the absorber of approximately 300°. The ratio of the area of sunshine collected (concentration ratio) to the area of the absorbing surface in this collector is approximately 6.5:1. Since it is desirable to reach the temperature of 250° in operation and above 300° as a maximum, the concentration ratio should be increased to about 11:1. This will also increase the operating efficiency of the unit, since the radiating surface of the absorber will be decreased and therefore both radiation and convection losses from this surface cut down.

The requirements for a solar energy refrigeration plant are briefly outlined, it being concluded that a reflector surface collecting 360 sq. ft. of sunshine per ton of refrigeration is indicated. To take care of losses this should be increased to 400 sq. ft.

Provision for storing the heat collected, or a part of it, so that the plant could remain in operation during cloudy periods and for at least 3 hr. after sunset will mean the storing of hot water or some other heated medium in sufficient quantities to furnish the reserve heat necessary for efficient operation. Insulated storage tanks will make this feasible. The storage of water at a maximum pressure of 80 lb. per square-inch-gage is recommended.

The use of an electric steam generator for the sterilization of dairy utensils on the farm, H. G. LINDQUIST (*Milk Plant Mo., 25 (1936), No. 1, pp. 30–32, fig. 1*).—This contribution from the Massachusetts Experiment Station describes the operation of a small electric steam generator and presents data on the efficiency of the unit for sterilizing various farm dairy utensils which had been contaminated with a specially prepared culture containing miscellaneous milk-grown organisms and coli aerogenes from cow manure. Utensils such as pails, strainers, and cans when exposed over the steam jet of this unit for from 4 to 7 min. were rendered practically sterile and dried out in a few minutes after removal from the sterilizer. Steam was available within 3.5 to 4 min. after turning on the current when operated at room temperature and in from 4 to 5 min. when operated at a temperature below 32° F. The unit required 0.85 kw.-hr. per hour for operation.

Effect of nature of filling material and dosing cycle on purification of creamery wastes, M. LEVINE, G. H. NELSON, and H. E. GORESLINE (*Iowa Engin. Expt. Sta. Bul. 124 (1935), pp. 56, figs. 3*).—The effects of various filling materials and dosing cycles upon the purification effected by, and the rate of discharge from, trickling filters were investigated in these studies, and the influence of the rate of discharge on the composition of the effluents was also observed. Sectional lath and cinder filters and solid cinder, quartzite, gravel, spiral ring packing, broken tile (burned clay), and corncob filters were studied. All filters were 2 ft. square and 6 ft. deep. Sectional filters consisted of six sections, each a foot high, separated vertically by 4-in. spaces. The waste was skim milk applied at the 24-hr. dosing rate of 550,000 gal. per acre. Actual application was made over a period of from 16 to 20 hr. per day. The concentration of the waste varied from about 200 to 1,600 p. p. m. oxygen demand.

Extremely high efficiencies were obtained with cinders, but they clogged quite frequently so that it was necessary to wash the filter after about 5 mo. of

operation. Moderate doses of $MgSO_4$, $CaCl_2$, and Na_2SO_4 did not affect the cinder filter efficiency.

The purification effected by corncobs was unexpectedly high, although nitrification did not develop. The corncob filter bed shrank 35 percent in depth. Efficiency decreased sharply at the end of the test, perhaps indicating an imminent failure in the purification function.

The 3-in. spiral packing was too large for outstanding results. Nitrification was quite satisfactory, however, and for smaller rings excellent results can be expected without danger of the clogging which eventually ensued in cinders, gravel, and broken tile.

Dosing cycles did not affect the efficiency of cinder filters, but on the quartzite the efficiency decreased as the length of cycle increased. Nitrate content of effluent was not affected. Probably some of the wastes were short circuited with the longer dosing cycles. With the longer cycles there were surges of comparatively unpurified sewage. Short cycles (2.5 to 5 min.) effected higher purifications, more constant run-offs, and more nearly uniform composition of effluents than did longer cycles (20 to 22 min.).

The more uniform the rate of run-off the more nearly the peak efficiency is reached for any given load.

Some observations on the European broad fish tapeworm Diphyllobothrium latum, J. E. THOMPSON (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 1, pp. 77–86, figs. 4*).—This is a report of observations conducted in Minnesota. It is pointed out that since ova of *D. latum* can pass through an Imhoff tank, the presence or absence of parasite ova in a sewerage system effluent should be used as an additional index in judging the efficiency of such plants.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the Ohio Station] (*Ohio Sta. Bimo. Bul. 181 (1936), pp. 98–102, fig. 1*).—The table of index numbers of production, prices, and income, by J. I. Falconer (E. S. R., 75, p. 555), is brought down through April 1936, and an article on Livestock Auctions in Ohio, by G. F. Henning and P. S. Eckert (pp. 98–101), showing the location of such auctions, the numbers of livestock handled yearly, the area of yards and premises, and the number of pens used by the 57 auctions handling more than 3,000 head of livestock annually, is included.

Current Farm Economics,, Oklahoma, [June 1936] (*Oklahoma Sta., Cur. Farm Econ., 9 (1936), No. 3, pp. 65–80, figs. 2*).—Included are articles as follows: The Oklahoma Farm Price of Cattle as Compared with the Kansas City and Chicago Price of Stockers and Feeders, by W. J. Fessler; Wheat Situation, by T. R. Hedges; Quality of the Oklahoma Cotton Crop for the Crop Year 1935, and Some Effects of Returning Classification Cards to Patrons of Gins Cooperating with Grade and Staple Statistics Section, both by C. B. Barre; and Some Financial Aspects of Cooperative Ginning of Cotton, by A. W. Jacob.

Rural land economics, 1933–1935, compiled by O. CUMMINGS (*California Sta., 1936, pp. [118]*).—This mimeographed bibliography includes "outstanding references relating to rural land economics, especially to the present national land policy."

Factors determining type-of-farming areas in Nebraska, L. F. GAREY (*Nebraska Sta. Bul. 299 (1936), pp. 32, figs. 16*).—This bulletin supersedes Bulletin 244 (E. S. R., 63, p. 884). It describes the physical, biological, economic, and other factors determining types of production in the State, and

the shifts in crops, livestock, and income that have taken place in the State from 1910 to 1934. Thirteen type-of-farming areas are designated for the State and described.

Evolution of an agricultural policy for Montana (*Montana Sta. Rpt. 1934, pp. 10–27, figs. 7*).—The investigations of the station in regard to land settlement, use, and ownership; taxes; irrigation; and range use are briefly discussed.

The rural indebtedness situation in Puerto Rico [trans. title], S. L. DESCARTES (*Puerto Rico Col. Sta. Bul. 42 (1936), Span. ed., pp. 44, figs. 2*).—This study is based chiefly on data obtained regarding 1,731 holdings, including about 12 percent of the total rural indebtedness of the island. Analyses are made to show the distribution of the indebtedness among different types of agricultural enterprises, increase in indebtedness 1920–34, sources of funds, relation of indebtedness to value of property, term of loans, interest rates, etc.

The total value of the properties studied was approximately $13,200,000 and the total indebtedness $6,000,000, which represented 83 percent of the value of the 906 holdings having indebtedness. The amount of indebtedness in 1930 was 297 percent of that in 1920. There was a decline to 286 percent in 1934. The indebtedness on coffee properties amounted to 82 percent of the estimated actual value of such holdings and to 102 percent of the actual value of the holdings with indebtedness. The percentages for other properties were sugar 34 and 68, tobacco 60 and 98, small fruits 41 and 89, tree fruits 69 and 79, and miscellaneous 35 and 96, respectively. For loans other than those from the Federal Bank and the Rehabilitation Commission the rate of interest varied from 7.4 to 8.9 percent, and the length of the loans averaged 4.1 yr.

Farmer bankruptcies decline further in 1935, but are exceeded in number by debt compositions and extensions (*U. S. Dept. Agr., Bur. Agr. Econ., 1936, pp. 5*).—Tables show by States for 1934 and 1935 the total number of bankruptcies and number of bankruptcies among farmers; the total number of bankruptcies and the number by farmers, employees and professionals, merchants, manufacturers, and other classes by years 1928–35; and the compositions and extensions of farmer cases during the fiscal year ended June 30, 1935, under sections 12, 74, and 75 of the National Bankruptcy Act.

Part-time farming in New Castle County, Delaware, M. M. DAUGHERTY (*Delaware Sta. Bul. 199 (1936), pp. 24*).—Data are gathered from 120 part-time farmers in the low-income groups in New Castle County in January and February 1934 in cooperation with the Bureau of Agricultural Economics, U. S. D. A., using Civil Works Administration funds. Analysis is made of cash incomes, length of farming experiences, location, value and area of part-time farm, value of products, etc.; of the relation of size and farm expenses; of number of cultivated acres and expenses, etc. The average value of the farms studied was $3,460 and the average earning outside of farming was $752. The average farming experience of the farmers was 9 yr. and their average age 46.7 yr. Slightly over 50 percent of the farmers had been raised on farms. Two-thirds of the farmers owned their farms, which were about two-thirds paid for. Large families did not raise more products than small families, and families in the low-income groups did not raise more than those in the larger-income groups. Fifty-five percent of the farmers stated that one acre or less would be all the land desirable if they were relocated. The most important advantage of part-time farming was given as economy by men and as a better place to rear children by women. The average saving was about $28 per month.

"The facts, as presented in this bulletin, show that part-time farming is not highly profitable, and that the operation of such a farm is attended with

much work and some inconvenience. Yet most of the occupants find the balance to be in favor of part-time farming as contrasted to living in a city."

Cost of producing farm products in New Jersey (*New Jersey Stas. Rpt. 1935. pp. 7–9*).—Brief summaries are included of findings as to costs of production of milk, poultry, asparagus, corn silage, sweetpotatoes, onions, apples, and peaches.

Cost of production of sweet potatoes, compiled by H. W. HAWTHORNE (*U. S. Dept. Agr., Bur. Agr. Econ., 1936, pp. 16*).—This is a compilation of the findings in studies made in Arkansas, California, Georgia, Louisiana, Mississippi, New Jersey, New Mexico, South Carolina, Texas, and Virginia for the years 1914–32, inclusive, by the Department and the State agricultural experiment stations.

Cost of production and grove organization studies of Florida citrus, C. V. NOBLE, Z. SAVAGE, and B. MCKINLEY (*Florida Sta. Rpt. 1935, pp. 32, 33*).—A table is given showing the average costs, returns, and profits per acre, 1932–33, of grapefruit plantings made from 1918 to 1920.

The manufacture and use of California canned orange juice, H. J. STOVER (*California Sta. Mimeogr. Rpt. 45 (1936), pp. [1]+27, figs. 6*).—This is a preliminary report based chiefly on a survey of the manufacturers of orange byproducts in California made in February 1936. Tables and charts include data on orange production, shipments, and prices in the United States; the packs of orange and other fruit juices in California; the relation of canned orange juice to sales of fresh oranges and other canned fruit juices, etc.

Creamery operating efficiency in California.—III, Relation of creamery capacity to supply of milk fat in Humboldt County, J. M. TINLEY, F. H. ABBOTT, O. M. REED, and J. B. SCHNEIDER (*California Sta. Mimeogr. Rpt. 44 (1936), pp. [2]+75, figs. 13*).—This is the third of the series of reports previously noted (E. S. R., 74, p. 717). It deals mainly with the problems of external or environmental plant efficiency—the extent to which the combined capacity of all the plants in a particular area is coordinated with the supply of raw materials available in that area or with the actual or potential demand for the products of those plants.

"This part of the study is divided into several sections. The first enumerates some of the more important economic principles involved in a study of external plant efficiency. . . . The second section is concerned with an analysis of the historical development of dairying in the area selected for the study. This involves an analysis of natural forces, such as climate and rainfall, and of feed conditions and farming practices, that influence the establishment and continuance of dairying in that area. Consideration is given to the increase in cow numbers and the trend of milk fat production, as well as to the probable future trend of dairying. The third section deals with the historical development of plants, and the fourth with the measurement of capacity and the efficiency of utilization of such capacity. Special attention is given to the circumstances leading to the expansion of capacity within previously existing plants and in new plants. In the fifth and final section an attempt is made to trace the effects of overexpanded capacity upon operating costs per unit and the returns to investors in creameries and to producers of milk fat in the area selected for the study."

Price factors in the Los Angeles milk market, J. M. TINLEY (*California Sta. Mimeogr. Rpt. 48 (1936), pp. 41, figs. 8*).—This is a statement prepared for presentation at the hearing on July 8, 1936, on the proposed stabilization and marketing plan for the Los Angeles milk marketing area. It supplements and brings up-to-date the more significant tables and figures relating to producers'

prices in the bulletin previously noted (E. S. R., 65, p. 483) and analyzes the economic effects of some of the recent developments in the Los Angeles milk market.

Organization and operation of the Illinois Livestock Marketing Association, H. H. HULBERT (*Farm Credit Admin. [U. S.], Coop. Div., Bul. 5 (1936), pp. IV+140, figs. 12*).—The Illinois Livestock Marketing Association was established in 1931 to federate the cooperative livestock marketing units of the State "with a view to broadening the marketing program and coordinating the activities of livestock cooperatives throughout the State." The study reported on in this bulletin was made "in order to analyze the economic background of this organization and to appraise, so far as possible, the success of the association in accomplishing its objectives." The changed conditions affecting livestock cooperatives leading up to the formation of the association, the organization, financing, etc., of the association; its field service program; the local operating practices; the distribution of sales by the association; direct-to-packers sales; the returns from direct-to-packers and terminal-market sales; and the operating problems of the association are described and discussed.

Appendixes include the code of bylaws of the association; the marketing agreements between the association and individual livestock producers and county livestock marketing associations, and between county livestock marketing associations and individual producers; the report of a special committee on operating policies of the association; and detailed information on direct sales of hogs by the association.

An analysis of the prices received for canned apricots by canners in California: Seasons, 1924–25 through 1935–36, H. J. STOVER (*California Sta. Mimeogr. Rpt. 47 (1936), pp. 19, figs. 7*).—This analysis corresponds to that on peaches noted above.

An analysis of the prices received for canned clingstone peaches by canners in California: Seasons, 1924–25 through 1935–36, H. J. STOVER (*California Sta. Mimeogr. Rpt. 46 (1936), pp. 19, figs. 7*).—"This report presents the results of an analysis which has been made for the purpose of determining the more important factors which have been responsible for the variations in the annual average f. o. b. prices received for canned clingstone peaches by canners in California from 1924–25 through 1935–36, and of measuring the influence of each of these factors upon those prices."

Imports of agricultural products into the United States and estimated acreage displaced (*U. S. Dept. Agr., Bur. Agr. Econ., 1936, pp. 18*).—A table is included showing for different agricultural products the average imports minus reexports 1926–28, average yield per acre 1924–28, the estimated acreages displaced by net imports, and the tariff rates in 1922 and 1930.

Fats and oils, and the excise taxes of 1934 (*U. S. Dept. Agr., Bur. Agr. Econ., 1936, pp. [2]+16*).—Tables are included showing the tariff rates, May 1936, on different fats, oils, and raw materials; the imports, general 1929, 1932, and 1933, and for consumption 1934 and 1935 and January to March 1935 and 1936 of different fats, oils, and raw materials; stocks of primary fats and oils, December 31, 1931 to 1935, inclusive, and factory consumption in the United States by years 1931–35 of coconut oil and fats and oils used in manufacturing soap and oleomargarine and in the drying industries; and the prices of different fats and oils, 1929, by years 1932–35, and April 1935 and 1936.

Crops and Markets, [June 1936] (*U. S. Dept. Agr., Crops and Markets, 13 (1936), No. 6, pp. 177–216, figs. 3*).—Included are tables, charts, reports, summaries, etc., of the usual types.

RURAL SOCIOLOGY

Rural sociology, J. M. GILLETTE (*New York: Macmillan Co., 1936, 3. ed., pp. XXXIV+778, figs. 44*).—In this revision of work previously noted (E. S. R., 60, p. 387) the author minimizes suggestions for social improvement or reform and maximizes a factual study of rural society. The volume is divided into six parts. Part 1 deals with rural society and rural sociology; part 2, with ecological conditions; part 3, with biosocial conditions; part 4, with sociocultural conditions; part 5, with rural-urban relations; and part 6, with rural social progress—special phases.

[Investigations in rural sociology by the Michigan Station], E. MUNFORD (*Michigan Sta. Rpt. 1935, pp. 232–234*).—The progress results are briefly presented of studies of the influence on agricultural leadership of early life on the farm; an analysis of the nationality and other population groups in Michigan and of their contribution to agriculture and rural life; and the standard of living of farm families in relation to community advantages.

National policy and rural public welfare, E. L. MORGAN (*Rural Sociol., 1 (1936), No. 1, pp. 8–19*).—The author calls attention to county social work on a partial taxation basis in the States of Iowa, Massachusetts, and New York as the beginning of modern rural public welfare in this country. He states that "the immediate future should provide permanent Federal planning based upon democratic participation of State, county, and local units, preferably along patterns already established in other fields; permanent centralization of leadership in a Federal Department of Public Welfare; administrative responsibility allocated to States vested in a somewhat similar administrative unit; a permanent cooperative plan of financial aid to States on a matching basis similar to that provided by the Smith-Lever and Smith-Hughes Acts, in which the State could make grants to counties under prescribed conditions and in which funds originating in counties could be used as State offset in matching Federal funds; the establishment of professional standards in public welfare work; the encouragement of research in rural public welfare; and a thorough dissemination among rural people of the philosophy of modern public welfare."

National policies and rural social organizations, L. NELSON (*Rural Sociol., 1 (1936), No. 1, pp. 73–89*).—The author discusses the effect of recent policies on the social profile of the country. "Rural people, along with urban, find themselves confused by the collapse of traditional forms and the conflicting ideologies struggling for dominance. Which of these ideologies will prevail, and the kinds of social controls which will result, we must leave to our children to describe."

Some sociological implications of the agricultural adjustment program, O. D. DUNCAN (*Assoc. South. Agr. Workers Proc., 35 (1934), pp. 202–206*).—The author points out some of the probable implications of the agricultural adjustment plan with reference to (1) the farm population, (2) problems which may be raised in regard to rural social agencies, especially the church, the school, and poor relief, and (3) the farmer's standard of living.

Rural emergency recreation and future rural social planning, B. L. MELVIN (*Rural Sociol., 1 (1936), No. 2, pp. 214–220*).—The author discusses the successes and failures of leisure-time programs among rural people carried out through the efforts of the U. S. Works Progress Administration. He concludes that "the recreational programs fostered by the extension service and the emergency agencies have emphasized the fact that a large segment of the rural population is not engaged in farming. This nonfarming group may increasingly constitute a service segment of the rural population. Its place may

lie more and more in the field of leisure-time activities, including the providing of facilities as well as leadership. In this the emergency programs for recreation have pointed the way."

Yardsticks for social planning, S. P. BURKE and V. F. PARRY (*W. Va. State Planning Bd. Bul. 1 (1935), pp. 75, figs. 47*).—In this report the methodology by which plans proposed for the social and economic development of a community or a geographic area may be intelligently analyzed and relatively evaluated is presented.

Forms and problems of culture-integration and methods of their study, P. A. SOROKIN (*Rural Sociol., 1 (1936), No. 2, pp. 121–141*).—The author defines human culture as follows: "In the broadest sense it may mean the sum total of everything which is created or modified by the conscious or unconscious activity of two or more individuals interacting with one another or conditioning one another's behavior." He classifies the main form of the integration of culture elements into four basic types: (1) Spatial or mechanical adjacency, (2) association due to an external factor, (3) functional or causal integration, and (4) internal or logico-meaningful unity.

Social standards for southern farmers, C. E. ALLRED (*Assoc. South. Agr. Workers Proc., 34 (1933), pp. 32, 33*).—The author defines social standards as the measure of the fullness and satisfaction of life on the farm. He then applies this measure to southern farmers.

County organization for program planning in Virginia, B. L. HUMMEL (*Rural Sociol., 1 (1936), No. 1, pp. 90–93*).—The author concludes that "it seems from results already achieved that it is advisable to combine the county boards with the local committees, and to develop county advisory boards and planning committees on a general community rather than a commodity committee basis. . . . Rural social organization is still a confusion of problems in the State as a whole, but with this progress in agricultural extension organization and county planning, and with a great many instances where more comprehensive community programs have been developed, we feel that we have a basis for further progress."

Needed standards of living for rural resettlement: A survey of 290 families in the Crandon, Wis., Land Purchase Area, E. L. KIRKPATRICK (*Madison: Wis. Rural Rehabil. Div., Resettlement Admin., 1936, pp. [3]+62, figs. 5*).—"This study was planned and conducted under cooperative arrangement between the department of rural sociology, Wisconsin . . . Experiment Station; division of research, finance and statistics, Federal Emergency Relief Administration; and rural (rehabilitation) division, Wisconsin Emergency Relief Administration. With transferral to the Resettlement Administration in July 1935, the Wisconsin rural rehabilitation division assumed responsibility for completion of the study, including distribution of the results."

Regional comparison of rural standards of living in Tennessee, C. E. ALLRED, W. E. HENDRIX, and B. D. RASKOFF ([*Nashville*]: *Tenn. Works Prog. Admin., 1936, Rpt. 15, pp. III+36, figs. 25*).—In this report of a study conducted cooperatively by the Tennessee Experiment Station, the Federal Works Progress Administration, and the Tennessee Works Progress Administration, the areas of the State were divided into three groups for purposes of comparison.

The rural community in the United States as an elementary group, D. SANDERSON (*Rural Sociol., 1 (1936), No. 2, pp. 142–150*).—The author points to the locality group as one of the most obvious elementary forms of social organization next to the family. "The determination of the type of rural community structure which, with due consideration to existing and historical conditions, will be most satisfactory for rural social organization forms one of the major problems of rural reconstruction facing many countries today."

Localization of dependency in rural areas, J. O. BABCOCK (*Rural Sociol., 1 (1936), No. 1, pp. 28–39*).—The author concludes "that we need a more thoroughgoing synthesis of the many factors present in a problem of this kind than we, as social scientists, are accustomed to make. We find many questions only partially answered when we consider the problem of dependency."

Concentration of rural relief in certain localities in North Carolina, G. W. BLACKWELL (*Rural Sociol., 1 (1936), No. 2, pp. 200–218, fig. 1*).—From a study of problem localities in North Carolina, the author concludes "that many problem villages, communities, and areas can, and should be, reconstructed economically and socially. It will be a paying proposition from many viewpoints. The cost per family rehabilitated thereby will doubtless be less than the per-family cost in newly created, organized rural communities. In some instances, however, resettlement of some of the population of problem communities and areas will be necessary, but folkways must be reckoned with. Where the type of people is an outstanding difficulty, aid from the social work profession clearly is needed. Loss of industry in rural areas, lack of sufficient cultivable land, submarginality of land, and general agricultural problems appear primarily to be the concern of Resettlement Administration. Through the cooperation of various governmental agencies now existing, much can be done for the people in these rural localities with long-time problems."

Littleville: A parasitic community during the depression, C. C. ZIMMERMAN, J. H. USEEM, and L. H. ZIEGLER (*Rural Sociol., 1 (1936), No. 1, pp. 54–72*).—"This study of Littleville shows how an almost chronically parasitic community greatly improved itself during the recent depression. . . . Its organs for nonparasitic existence have atrophied from disuse, while those for collective exploitation of the outer world have been sharpened."

The study of the life cycle of families, C. P. LOOMIS (*Rural Sociol., 1 (1936), No. 2, pp. 180–199*).—"Studies of the family have given too little attention to the life cycle. . . . Of interest to students of population and students of the economic and social life of the family is the difference between the manner of adjustment of the city family, on the one hand, and the farm family, on the other, as the two different groups pass through their life cycles. The few studies in existence indicate that poorer city families must either restrict the number of children or reduce their material standard of living to bring children into the world. The farm family, on the other hand, has a somewhat better opportunity of increasing its income, through increased exertion on the part of adult members and in some instances of the small children who may aid considerably in supporting themselves long before they would approach self-sufficiency in the city. Data are presented which show that the whole social and economic life of rural families is different in various stages of the life cycle. Professor Sorokin and Russian authorities have delimited four stages in the life cycle of the family. Four similar stages in the life cycle of white North Carolina farm families were studied, and it was found that this analysis threw light on differentials in biological, economic, and social activity. Other studies made under other conditions and with the use of different methods agree with the findings of the North Carolina study in some instances and not in others."

Population mobility, C. E. LIVELY (*Rural Sociol., 1 (1936), No. 1, pp. 40–53*).—The author deals with the spatial and occupational mobility of the rural population of the United States. The movements of families and individuals by which they attempt to orient themselves geographically and occupationally are analyzed.

The anual rate of departure of rural youths from their parental homes, C. H. HAMILTON (*Rural Sociol., 1 (1936), No. 2, pp. 164–179, figs. 5*).—This paper

has presented a simple and practical method of measuring and analyzing the rates at which rural young people depart from their parental homes. The basic data needed for this type of study are very few and could be collected extensively and rapidly through simple enumerations of the population or in connection with other social studies. There is a relationship between the variations in departure rates and the economic status of the families involved, whether the economic status is measured by relief, color, tenure status, or the general income available. It has been shown in a number of studies that the standards of living of poor people are much more dependent on income than is the case of the well-to-do. It is not surprising, therefore, to find departure rates of rural youth following a similar pattern.

Rural young people face their own situation, E. L. KIRKPATRICK and A. M. BOYNTON (*Rural Sociol., 1 (1936), No. 2, pp. 151–163*).—A survey was made of Waushara County, Wis., in which 2,123 schedules were filled out by rural young people between the ages of 15 and 29, two-thirds of whom reside on farms and the remainder in villages of less than 2,500 population. The questions asked were: "What is known about these rural young people? Where do they live? What are they doing? How much schooling have they had? What choices of occupations do they have? To what extent does farming appeal to them? How are they using their spare time? What can be done to improve their situation? To what degree do they sense needs in the home community? And what opportunities do they see to improve local conditions?"

"Even though these results are preliminary, they indicate that young people recognize their situation and are aware of certain needs in the immediate localities. They show that young men and women are actually thinking of possible developments and indicate that they are rapidly becoming more eager to work out definite programs for the realization of specific objectives."

Size of family in relation to homogeneity of parental traits, W. C. MCKAIN, JR., and N. L. WHETTEN (*Rural Sociol., 1 (1936), No. 1, pp. 20–27*).—Data obtained from a survey of 1,816 families residing in the township of Windsor, a surburban area adjacent to the city of Hartford, Conn., led the authors to the conclusion that there is a positive correlation between the homogeneity of parents and the size of their families. They suggest, however, that the results obtained by them be tested by others.

Trade centers in Tennessee, 1900–1930, C. E. ALLRED, B. H. LUEBKE, and J. H. MARSHALL (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Rpt. 16 (1936), pp. III+30, figs. 10*).—This report pays particular attention to the number, size, and distribution of trade centers and to factors related to their appearance and disappearance, growth, and decline.

A survey of scenic and recreational resources of Utah, S. R. DE BOER and G. M. P. DOUGALL (*Salt Lake City: Utah State Planning Bd., 1936, pp. [5]+106, figs. 17*).—"This report deals primarily with the basic data gathered on the scenic and recreational resources to be found in Utah, the laws affecting existing and future development of these resources, and comparisons of Utah tourist travel with other States."

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Health service in secondary schools of Idaho (*Idaho Sta. Bul. 220 (1936), p. 25*).—Results from a questionnaire sent 37 high schools are briefly noted.

A manual for 4–H poultry club members, H. H. ALP and E. I. PILCHARD (*Illinois Sta. Circ. 452 (1936), pp. 31, figs. 14*).—The Illinois plan for 4–H poultry club work is outlined and the fundamentals of poultry production and management explained.

FOODS—HUMAN NUTRITION

President's address: Research and our food industries, F. C. BLANCK (*Jour. Assoc. Off. Agr. Chem., 19 (1936), No. 1, pp. 34–38*).—This paper from the U. S. D. A. Bureau of Chemistry and Soils is a general discussion of the relation of research to the food industries such as canning; meat; jams, jellies, and preserves; dairying; and the frozen pack industry, and of the progress made in the field of food containers. Research in the food field is discussed with reference to unsolved food problems such as the nature, cause, and prevention of rancidity; the nature of the color and the flavor of natural foods; the ash constituents of American foods; utilization of waste and refuse material incident to food packing; and the effect of light on the composition, color, and physical consistency of manufactured foods.

[Food and nutrition studies by the Florida Station] (*Florida Sta. Rpt. 1935, pp. 70–72, 130, 131*).—In this annual report summaries, some of which are extensions of previous work (E. S. R., 72, p. 413), are included by C. F. Ahmann on the relation of growth to phosphorus, calcium, and lipin metabolism as influenced by the thymus; by O. D. Abbott on the study of lecithin synthesis in hens on a vitamin A- and lipoid-free diet and on a study of the hematopoietic tissues of rats on a diet low in vitamin A; by L. W. Gaddum on a study of the chemical composition of the more unusual constituents of the ash of Florida fruits and vegetables; by Abbott on an investigation in Alachua County, with special reference to nutritional anemia in relation to the composition of home-grown foods; by Ahmann on the pharmacological action of papain; and by F. D. Stevens and J. R. Neller on sugarcane sirup and sugarcane-citrus sirup blends.

A study of winter food consumption in Wisconsin farm families, M. L. COWLES (*Jour. Amer. Dietet. Assoc., 11 (1935), No. 4, pp. 322–330, figs. 2*).—For this food consumption study 109 rural families representing high, medium, and low incomes per farm were selected from three Wisconsin counties. The weekly average cost of the food consumed by these families was found to be $10.01, or $2.29 per adult male; 32 percent was bought and the remainder furnished by the farm. As the number in the family increased, the expenditure for food per adult male unit decreased.

A computation of the calories, protein, iron, calcium, and phosphorus of 1 week's food consumed by 57 of the families was made and compared with requirements for energy, protein, and minerals as indicated by the scales prepared by Hawley Iron was found to be deficient in the largest number of diets. Phosphorus and calories were markedly deficient, and calcium was low in some of the diets. Protein requirements were adequately met in most of the diets due to the intake of meat and milk furnished by the farm. There was apparent a possible deficiency in vitamins B and C due to the low intake of vegetables and citrus fruits and to the use of highly refined cereals. Of the total diets, 31.6 percent showed some deficiency.

Diets became more adequate as the cost for food increased, due to the quantity rather than the judicious selection of food. A week's diet costing $2.40 per adult male unit showed no deficiency.

Relative economy of different forms of milk as sources of protein, calcium, and phosphorus, M. M. KRAMER and B. L. KUNERTH (*Jour. Amer. Dietet. Assoc., 11 (1935), No. 4, pp. 318–321, fig. 1*).—In this contribution from the Kansas Experiment Station, the total grams of protein, calcium, and phosphorus in 1 qt. of fresh whole and skim milk, 1 lb. of dried whole and fresh milk, and a can containing 14.5 oz. of evaporated milk are compiled in table form, together with their cost per gram.

Problems of poultry cookery, B. LOWE (*U. S. Egg and Poultry Mag., 42 (1936), Nos. 5, pp. 272, 273; 6, pp. 336, 337, 383, 384*).—Certain aspects of poultry cookery differing from general meat cookery are given in this paper. Criteria which determine palatability and factors that influence cooking temperatures are discussed from the standpoint of poultry cookery.

Preparation of the birds for cooking is discussed with reference to the effect of rigor mortis, temperature and length of time in storage, acidity in the muscles, and freezing and freezer burns on the palatability, particularly tenderness, and on the cooking losses. The treatment of drawn poultry with carbon dioxide is recommended as a treatment against bacterial contamination and spoilage. Palatability as affected by cooking methods is discussed from the standpoint of cooking before or after defrosting, in covered or uncovered pans, and of high or low temperatures, of fat distribution, and of the effect of basting with fat on the texture of the skin when the poultry is cooked uncovered. Suggested problems in poultry cookery to be worked out by a physiological or a biological chemist are the types and kinds of meat proteins, their properties such as solubility, ability to hold moisture, and coagulability, and the effect of salt, acids, and alkalies on these and the nature of flavor.

A study of the nutritive value of mushrooms, F. W. QUACKENBUSH, W. H. PETERSON, and H. STEENBOCK (*Jour. Nutr., 10 (1935), No. 6, pp. 625–643, figs. 5*).—Feeding experiments with rats by the usual technic at the Wisconsin Experiment Station gave evidence that the mushroom *Agaricus campestris* incorporated in the diet in a dried state reduced the food intake and consequently the growth by from 40 to 45 percent in some cases, thereby hampering the investigation. No such effect was observed when mushrooms were fed to animals depleted of vitamins B and G. The authors discussed the possible causes for the difficulty, such as toxicity, indigestibility, and dilution of the ration, but arrived at no satisfactory explanation.

Levels of 5 and 10 percent of dried mushrooms supplied sufficient vitamins B and G to support satisfactory growth. Diets containing 10 percent of mushrooms as a source of vitamin B point to a deficiency other than B and G.

The data on the mushroom protein were preliminary and incomplete.

A study of culinary quality in white potatoes, J. S. COBB (*Amer. Potato Jour., 12 (1935), No. 12, pp. 335–346*).—This contribution from the Pennsylvania Experiment Station covers experimental work from 1929 to 1933.

The external tuber characteristics were not found to be a reliable index of quality except that small ill-shaped or immature potatoes were observed to have poor quality. Good cooking quality was closely associated with high starch and dry matter content of the tuber and low nitrogen content. Baked potatoes gave higher quality scores than boiled ones of the same lot. A large number of tests showed a 25 percent loss of weight due to loss of water during baking, while boiling gave neither loss nor gain of weight.

Lower temperatures, sufficient rainfall, and the variety favored better quality potatoes. The higher altitude with a lower average temperature and with rainfall no greater than at lower altitudes produced better quality potatoes. Any type of soil, heavy silty clay type, or gravelly or shaly type seemed to grow good potatoes. No distinctly potash-deficient soil was used in any test, but all fertilizer treatments used improved the yields and quality.

Beverages from rhubarb, W. F. WALSH and D. K. TRESSLER (*Fruit Prod. Jour. and Amer. Vinegar Indus., 15 (1936), No. 9, pp. 262, 263*).—The method developed at the New York State Experiment Station for preparing juices from rhubarb used thoroughly washed tender, succulent stalks which were shredded and pressed with a hydraulic press. The yield varied from 60 to

75 percent of their weight as juice. The juice was clarified after heating to 120° F. by flocculating the small particles of cellular debris in suspension with the pectic enzyme preparation Pectinol A and by filtering. Since excessive amounts of the soluble potassium oxalate present in the juice are undesirable, the oxalate was removed by treatment with calcium carbonate at 180°, and the juice then chilled at from 32° to 40° to precipitate the insoluble calcium oxalate, and filtered. The resulting juice was described as brilliantly clear and remained in this condition and retained its rhubarb flavor during nearly a year's storage.

The total acidity of the juice, expressed as malic acid, ranged from 1 to 1.7 percent, depending upon the variety and maturity of the stock. The Victoria and Strawberry varieties were found to be excellent stock for juice purposes, the Pineapple variety lacked a characteristic flavor, and the Ruby variety was used advantageously for its red color which was imparted to the juice.

Rhubarb juice was found pleasing to the palate in plain and carbonated beverages in which it was diluted with water to reduce the total acidity to from about 0.7 to 0.8 percent and sweetened with sufficient cane sugar to bring the total solids content to 14 percent as read on the Brix scale. It was also found suitable as a blender with other fruit juices such as sweet, insipid cider, Montmorency cherry juice, Concord grape juice, and citrus and berry juices.

Factors which affect the quality of canned tomatoes.—I, A study of the physical and chemical constituents of Arkansas Marglobe tomatoes, M. E. SMITH (*Fruit Prod. Jour. and Amer. Vinegar Indus., 15 (1935), Nos. 3, pp. 81–83, 91, figs. 2; 4, pp. 114, 115, 122, fig. 1*).—In this report of an investigation at the University of Arkansas, the effect of temperature and precipitation is shown on the canning qualities of tomatoes. Marglobe tomatoes grown on the experimental farm were canned at various intervals from June 28 to August 6, 1934. Climatic conditions during the growing season were recorded.

The season was hot and dry and unfavorable to growing tomatoes of high quality. Sunscald was the principal defect, followed by catfaces and other minor blemishes. The fruit ripened unevenly to the extent that a large amount was unripe at every picking. This unripe fruit allowed to ripen under cover compared favorably, however, with the field-ripened fruit.

The results show that when the temperature was highest the acidity of fresh and canned tomatoes was highest and the total solids and the yield per pound were lowest. Also, at maximum temperatures the amount of invert sugar was high, resulting in substandard quality packs. An exception was the pack on August 6, when previous precipitations improved the quality of the flesh and flavor.

Charts are given showing the yield of fresh fruit per can per pound, percentage of total solids, the pH of fruit and canned fruit juices, and invert sugars, as well as tables showing the results of the physical tests and chemical analyses.

Preservation of fruits and vegetables by freezing, E. H. WIEGAND (*Oregon Sta. Circ. 116 (1936), pp. 12*).—In this circular information is given on the methods of packing, freezing, and storing fruits and vegetables. The best temperatures for freezing are considered to be from 5° F. below zero to 10° above zero and for storage from 10° to 15° above zero. Uniform temperatures during freezing and storage may be maintained with fans and adequate insulation and are important to prevent losses through mold growth and development of unpleasant flavors.

Sugar used dry or in solution in the ratio of 3 parts fruit: 1 part sugar improves the fruit and decreases oxidation processes. Vegetables are packed either well-drained or in a 2-percent brine. Leaving from ½ to 1 in. space

at the top of a filled container allows the liquid and products to expand during freezing. Rapid freezing is important to prevent color changes and improves and retains the important flavors of the food. The cooking time for frozen products should be reduced to half the normal cooking for the fresh product. Frozen vegetables without brine should be placed in boiling water and allowed to cook until soft. Vegetables with brine should be allowed to thaw and then cooked in the brine.

Special methods of preparation are described and tabulated for blackberries, blueberries, cranberries, loganberries, black and red raspberries, strawberries, Youngberries, black, sour, and white cherries, apricots, figs, grapes, peaches, prunes, asparagus, green and wax beans, lima beans, broccoli, cauliflower, sweet corn, mushrooms, peas, and spinach.

Effect of storage, freezing, and canning on the nutritive value of vegetable products, C. R. FELLERS and P. D. ISHAM (*Veg. Growers Assoc. Amer. Ann. Rpt., 1935, pp. 85–97*).—This contribution from the Massachusetts Experiment Station gives statistics showing that the greater percentage of the 1933 vegetable crop was used for manufacture, such as canning, freezing, pickling, and dehydration and a table indicating the chemical composition, including vitamin content, of the edible portion of fresh vegetables. The effects of shipping, storage, freezing, and canning have been mainly noted above. The effects of dehydration were losses through destruction of vitamins B and C and to some extent vitamin A. Sulfuring, a process applied only to dried fruits, tended to retain vitamins A and C. The manufacture of kraut and pickles, a process of fermentation, converted the vegetable sugars into lactic acid which resulted in some loss of vitamin C through destruction and of minerals through solution in the brine. The various losses through processes of manufacture were not considered serious in view of the large portions of vegetables used in the American diet.

Bacteriological problems involved in the home canning of foods, C. C PROUTY (*Northwest Sci., 10 (1936), No. 2, pp. 9–11*).—This contribution from the Washington Experiment Station emphasizes the importance in home canning of using processing methods which designate such temperatures, period of exposure, and equipment as to insure destruction of the spores of *Clostridium botulinum* and other bacteria causing spoilage, especially for the nonacidic vegetables and meat products. Certain thermophilic bacteria are not destroyed by either commercial or home processes. To prevent the growth of these organisms canned goods should be stored at a low temperature. Boiling temperature for nonacidic fruits and vegetables and meat products destroys the botulinus toxin.

[Bacteria in sugar], W. V. HALVERSEN (*Idaho Sta. Bul. 220 (1936), p. 25*).—Tests of 13 samples of sugar for thermophilic bacteria are noted.

[Bacterial studies], W. L. MALLMANN (*Michigan Sta. Rpt. 1935, pp. 207–210*).—Investigations are reported in detail as to the spoilage of frankfurters and restaurant sanitation.

Detection and significance of Escherichia coli in commercial fish and fillets, F. P. GRIFFITHS and J. E. FULLER (*Amer. Jour. Pub. Health, 26 (1936), No. 3, pp. 259–264*).—This cooperative study by the U. S. Bureau of Fisheries and the Massachusetts Experiment Station dealt with the occurrence of bacteria of the coli-aerogenes on 20 commercial haddock fillets and 5 eviscerated haddock purchased from the local retail market. *E. coli* was identified to investigate the possibility of using its occurrence as an index of the sanitary quality of fish. Typical *E. coli* were found on 16 fillets and 2 eviscerated fish. Differential tests indicated the presence of lactose-fermenting bacteria other than the *E. coli*.

Basal metabolism of Wyoming University women, E. J. McKittrick (*Jour. Nutr., 11 (1936), No. 4, pp. 319–325*).—This investigation was undertaken at the Wyoming Experiment Station to determine the basal metabolism of 100 normal young women between the ages of 17 and 26 yr., most of whom had lived in Wyoming more than 10 yr. The usual procedure of determining basal metabolism was followed. Deviations from the standards of Aub-Du Bois, modified by Boothby and Sandiford, and of Harris-Benedict were calculated and found to average —3.18 and —2.54 percent, respectively. These metabolic rates were higher than those previously found by Tilt and Walters (E. S. R., 74, p. 130) in Florida and Coons (E. S. R., 66, p. 890) in Oklahoma, determined under similar conditions. These results indicate that the higher altitude of Wyoming, as compared to that of Florida and Oklahoma, speeds up the metabolic rate.

A table gives the basal metabolism values and deviations from the standard for each of the 100 women.

The energy requirement of farm women, N. B. Morey (*Jour. Home Econ., 28 (1936), No. 1, pp. 38–44*).—This is a report of an investigation made at the [New York] Cornell Experiment Station. "The energy requirements of farm women have here been estimated from time studies and figures for energy expended per kilogram per hour in various activities, and have been compared with the energy intake of farm women as shown by studies of individual women. The results derived from both methods of study point to an average energy requirement of about 2,500 to 2,600 calories per day for farm women not regularly engaged in actual farm labor. Similar comparisons for town and city women indicate a smaller energy requirement, about 2,200 to 2,300 calories, for the average town or city housewife. The dietary scales and standards in general use in this country make an allowance of 2,700 to 3,000 calories for farm women and about 2,400 to 2,500 calories for the woman 'at moderately active work', which is usually interpreted to mean ordinary housework. It seems, therefore, that these scales and standards tend to overestimate the energy needs of women generally."

The relation of the rate of growth to diet.—III, A comparison of stock rations used in the breeding colony at the Connecticut Agricultural Experiment Station, L. B. Mendel and R. B. Hubbell (*Jour. Nutr., 10 (1935), No. 5, pp. 557–563, fig. 1*).—In this paper of a series from the Connecticut [New Haven] Experiment Station and Yale University, a comparison is made of the growth, the reproductive performance, and the diet of the albino rat during three periods of history of the stock colony at the station. Observations for the first two periods were noted previously (E. S. R., 56, p. 191; 67, p. 772).

The ration in use at the time of writing was calf meal and cod-liver oil reinforced in vitamin D, and in addition nursing mothers and young rats under 6 weeks of age received a paste food consisting of casein, whole milk powder, wheat embryo, and lard. This ration was supplied ad libitum and supplemented with 1 g dried yeast per rat per day. Those rats not receiving the paste food were given 3 g of wheat embryo per week.

Data for the colony at different periods in its history afford evidence of the effectiveness of the present ration for reproduction, as judged by the number and size of litters, percentage weaned, and weights of the young at birth and at weaning. A marked increase in growth of both male and female rats was noted following the change in the ration in 1931 to one richer in protein and using definite amounts of dried yeast and wheat embryo, which were fed separately.

The utilization of energy producing nutriment and protein as affected by individual nutrient deficiencies.—III. The effects of the plane of protein intake, E. B. FORBES, R. W. SWIFT, A. BLACK, and O. J. KAHLENBERG (*Jour. Nutr., 10 (1935), No. 5, pp. 461–479, figs. 7*).—This investigation, conducted at the Pennsylvania Experiment Station, repeated as nearly as practicable the experiments and procedure of study reported in two earlier papers previously noted (E. S. R., 72, p. 371; 73, p. 414).

"The effects of the increasing protein content of the equicaloric diets were as follows: Increase in gain in body weight at decreased cost in terms of dry matter of food; increase in efficiency of digestion and retention of protein and of energy-producing nutrient; increase in urinary nitrogen at an increasing rate and increase in protein of the body at a decreasing rate; increase in energy of the urine coincident with decrease in the energy of the feces, the metabolizable energy, therefore, remaining practically constant; diminished efficiency in the utilization of food nitrogen; no regular change in amount of fat gained, but usually a decrease in fat gained in proportion to protein gained.

"Increases in the protein of equicaloric diets having the effect to improve their nutritive balance made no change in the basal heat production per unit of computed surface area, but diminished the total heat production of the animals, as they lived under normal conditions of freedom of activity."

Feeding experiments with mixtures of highly purified amino acids, VII, VIII (*Jour. Biol. Chem., 112 (1935), No. 1, pp. 275–302, figs. 3*).—In continuation of the series noted previously (E. S. R., 73, p. 270), two papers are presented.

VII. *The dual nature of the "unknown growth essential"*, M. Womack and W. C. Rose (pp. 275–282).—The unknown growth essential was separated into two components by their difference in solubility in aqueous butyl alcohol. The more soluble one was identified as isoleucine by deductions made from the growth responses in rats fed isoleucine and the less soluble component.

VIII. *Isolation and identification of a new essential amino acid*, R. H. McCoy, C. E. Meyer, and W. C. Rose (pp. 283–302).—The second component was isolated in pure crystalline form and identified as α-amino-β-hydroxy-*n*-butyric acid. Approximately 0.6 percent of the amino acid was required to promote good growth in rats on a diet furnishing 18 percent of effective amino acids.

These experiments are the first to successfully induce growth in animals receiving mixtures of purified amino acids in place of protein.

Hydroxyglutamic acid and citrulline were found to be nonessential for growth.

Synthesis of α-amino-β-hydroxy-n-butyric acids, H. E. CARTER (*Jour. Biol. Chem., 112 (1936), No. 2, pp. 769–773, fig. 1*).—The α-amino-β-hydroxy-*n*-butyric acid, noted above, was synthesized according to the method described by Abderhalden and Heyns.[3] The synthesized substance had no growth-promoting properties even when fed at high levels. It was converted into a mixture of two possible epimers by heating the formyl derivative prepared by the method of Du Vigneaud and Meyer[4] with sodium hydroxide and acetic anhydride and hydrolyzing with concentrated hydrobromic acid. This mixture incorporated in a diet containing all the known amino acids except hydroxyglutamic promoted the growth of rats.

Enzymic digestion of lactalbumin versus casein in vitro, M. C. KIK (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 2, pp. 194–196*).—This study, made at the University of Arkansas, followed the technic of Sure et al. (E. S. R., 74, p. 743) of digesting in vitro three concentrations, 120, 180, and 210 mg, of casein

[3] Ber. Deut. Chem. Gesell., 67 (1934), No. 4, pp. 530–547.
[4] Jour. Biol. Chem., 98 (1932), No. 2, pp. 295–308.

and lactalbumin by trypsin and erepsin present in pancreatic and intestinal extracts of rats. The rate of digestion was followed by the percentage of amino nitrogen liberated. The results show casein to be more readily digested than lactalbumin under similar conditions.

A summary of the tryptic-ereptic digestion of the two proteins is given in a table.

The substitution of dithioethylamine (cystine amine) for cystine in the diet of the white rat, H. H. MITCHELL (*Jour. Biol. Chem., 111 (1935), No. 3, pp. 699–705*).—With the use of the paired feeding method the growth-promoting properties of cystine amine have been compared with cystine. Contrary to the evidence obtained by Sullivan, Hess, and Sebrell (E. S. R., 66, p. 389) from the ordinary ad libitum feeding indicating that cystine amine is capable of replacing cystine, the paired feeding tests show that cystine amine is not only incapable of replacing cystine in the diet, but definitely depresses the growth-promoting value of a cystine-deficient diet and impairs the appetite of the animal consuming it.

Commenting upon the paired feeding method with restriction of food consumption, the author states that "a severe restriction of food intake in a paired feeding experiment does not invalidate the comparison of rations; it merely delays the appearance of the effects of differences in nutritive value."

The effect of cereal diets on the composition of the body fat of the rat, H. S. OLCOTT, W. E. ANDERSON, and L. B. MENDEL (*Jour. Nutr., 10 (1935), No. 5, pp. 517–523*).—This contribution to the literature on the character of body fat as modified by diet deals with the character of fat produced by rats on rations in which the cereal grains corn, oats, wheat, and barley were each fed at levels furnishing 82 percent of the total energy value of the ration. The oil content of the cereals was such that the oil of corn supplied 8 percent, oats 10, wheat 3, and barley 4 percent of the total calories of the ration. The body fats produced on the various rations had iodine numbers of 33, 79, 70, and 71, respectively. The fats of the animals receiving wheat and barley were similar in character to the fat obtained from animals fed fat-free diets. The unsaturated fatty acids ranged from about 75 percent of the total body fat in the corn-fed animals to between 68 and 70 percent of the fat of the barley-fed animals. "The results suggest that some of the food unsaturated fatty acids are stored in preference to 'synthetic' fat when the food fat exceeds a certain minimal level, which level might be dependent upon the degree of unsaturation of the dietary fat."

Physiological effects of pituitary growth hormone: Growth and efficiency of food utilization, H. W. NILSON, L. S. PALMER, and C. KENNEDY (*Amer. Jour. Physiol., 111 (1935), No. 2, pp. 341–351, figs. 4; abs. in Minnesota Sta. Rpt. 1935, pp. 34, 35*).—In this study the strains of rats previously described (E. S. R., 70, p. 420) were used to determine the effect of injecting 1 cc of antuitrin G, a preparation of the pituitary growth hormone, on food utilization and growth rate. Growth was determined by weekly period changes, graphical analysis of group growth rate data, and statistical evaluation of mean group weights.

The results indicated that the hormone increased the growth rate and the efficiency in dry matter utilization within certain inherent limits which were controlled by sex and genetic factors. Females made a greater response than males. Rats having a low efficiency of food utilization responded more definitely to the hormone injection than those having a higher efficiency, but never attained the higher efficiency level. The increase in efficiency was not accompanied by increased digestibility. Water consumption was closely corre-

lated with dry matter intake, although it was not specifically increased by the growth hormone. Changes in live weight of rats were found to be satisfactory indexes for true growth, as indicated by chemical analysis on the carcasses of female rats having a low efficiency of food utilization after injections of the hormone. These analyses showed a decrease in the dry matter and fat content of the body tissues.

Some effects of cod liver oil and wheat germ on the retention of iron, nitrogen, phosphorus, calcium, and magnesium during human pregnancy, C. M. and R. R. COONS (*Jour. Nutr., 10 (1935), No. 3, pp. 289–310, fig. 1*).—As a supplement to the extensive investigation at the Oklahoma Experiment Station on the metabolism of pregnancy (E. S. R., 73, p. 715), a special study was made of the effect of cod-liver oil as a source of vitamins A and D and a wheat germ preparation as a source of the vitamin B complex on the retention of calcium, phosphorus, nitrogen, and iron during the latter part of pregnancy. The study, which was conducted on one subject, covered 101 days of continuously regulated diet during 82 days of which the diet was weighed. The retention of iron was improved by the wheat germ preparation and this was also true of nitrogen. Cod-liver oil enhanced this effect, but improved the retention of calcium, phosphorus, and magnesium only slightly. The subject purposely kept out of the sunlight during the entire period of study. As the retention of calcium was much lower than reported in earlier studies on a group of women receiving as much sunlight as possible during pregnancy, it was concluded that exposure to sunlight is more effective than cod-liver oil in conserving the much needed calcium.

Hydremia as a factor in the anemia of pregnancy, H. FELDMAN, E. C. VAN DONK, H. STEENBOCK, and E. F. SCHNEIDERS (*Amer. Jour. Physiol., 115 (1936), No. 1, pp. 69–77, figs. 2*).—Blood samples from 20 patients on relief rolls were taken at intervals during pregnancy and after parturition, and determinations made on the blood constituents, percentage of total proteins, and percentage of water. It was noted that blood showed a progressive anemia for 180 days or longer before parturition as indicated by a fall of hemoglobin values, cell volume, and refractive index and a simultaneous increase in water content. The reduction of protein content was less marked than the other blood constituents. The data are similar to those obtained with the pregnant rat (E. S. R., 73, p. 282).

The blood of 40 cows before and after parturition was studied, following the same procedure as with human blood, but showed very little change during pregnancy.

Some observations on the physiological adjustment of the albino rat to a diet poor in salts when edestin is the source of dietary protein, P. P. SWANSON, G. H. TIMSON, and E. FRAZIER (*Jour. Biol. Chem., 109 (1935), No. 2, pp. 729–737*).—This investigation at the Iowa State College presented evidence that a ration poor in salts and containing casein as the source of protein had a specific erythropoietic effect on the blood of the rat. When the casein was replaced by edestin, a globulin, no drastic increase in erythrocytes was noted, but a severe diuresis accompanied by increased consumption of water developed.

Trace elements in nutrition, C. A. ELVEHJEM (*Jour. Home Econ., 28 (1936), No. 2, pp. 111–117*).—This paper from the Wisconsin Experiment Station reviewed recent studies on the significance of minute quantities of iron, copper, manganese, cobalt, and zinc in the diet and on the availability of iron, including a table on the percentage of available iron as determined by the *a*adipyridyl method in 16 food materials. The addition of small amounts of the trace elements to the diet in cases of detected deficiencies is discussed. A list of 35 references is given.

A study of iron metabolism with preschool children, L. ASCHAM (*Jour. Nutr., 10 (1935), No. 3, pp. 337–342*).—This contribution from the Georgia Experiment Station reports iron balance studies conducted for five 3-day periods on 6 normal institutional children (4 boys and 2 girls), ranging in age from 4 to 6 yr. and in weight from 17.1 to 19.3 kg. Although there were a few negative balances in single periods, the average balances for each child for the entire 15 days were positive, ranging from 0.01 to 0.15 mg per kilogram of body weight on iron intakes ranging from 0.55 to 0.64 mg daily.

It is noted that the iron requirement, as indicated by the data obtained, is in fair agreement with the standards proposed by Daniels and Wright (E. S. R., 73, p. 564) and by Rose et al. (E. S. R., 65, p. 290), but higher than the allowance of Leichsenring and Flor (E. S. R., 67, p. 475). It is suggested that some of the differences in retention reported by different investigators may be due to differences in the availability of iron in the foods used.

The banana as a source of iron for hemoglobin formation, M. C. SMITH and L. OTIS (*Jour. Home Econ., 28 (1936), No. 6, pp. 395–398, fig. 1*).—This investigation, made at the Arizona Experiment Station, determined the availability of iron for hemoglobin formation by biological tests with anemic rats according to the method of Elvehjem and Kemmerer (E. S. R., 67, p. 90) and by the chemical $\alpha\alpha'$dipyridyl method of Hill (E. S. R., 64, p. 712). Banana powder was fed in place of fresh bananas at the maximum level of 4 g daily. This amount contained 0.098 mg of iron, which was considerably below the 0.3 mg of iron level used by Elvehjem et al. Four groups of nutritionally anemic rats were fed diets supplemented, respectively, with 4 g banana powder, with 4 g banana powder and 0.05 mg copper as copper sulfate, with 0.098 mg iron as iron chloride and 0.05 mg copper, or with 0.3 mg iron and 0.05 mg copper.

The average 6-week gain in hemoglobin on the supplemented diets in the order named above was 4.3 g per 100 cc of blood, 6.1 g, 6.5 g, and 9.6 g. These results indicated that copper was the limiting factor in the banana for complete utilization of the iron. The chemical dipyridyl method indicated the iron in the banana to be from 90 to 100 percent available. Difficulty was encountered in comparing the red color developed in the banana powder by this method with the standard because of a persistent yellow tinge even after bleaching and of adsorption of the red color on the protein fraction. Repeated washings were found necessary to approximate complete removal of the adsorbed color.

The food value of ethyl alcohol, H. H. MITCHELL (*Jour. Nutr., 10 (1935), Nos. 3, pp. 311–335; 5, p. 459*).—In this reinvestigation of the subject the general plan followed was "to feed pairs of rats equal quantities of a good basal diet and to give to one rat of each pair variable supplements of 95 percent alcohol. The nutritive effects of the alcohol were measured by determining the growth rates of pair mates over a number of weeks of this regime and by investigating the nitrogen and energy contents of the tissues formed from an analysis of the carcasses. The observed effects of alcohol were compared with the nutritive effects of sucrose determined in an entirely similar fashion, supplements of sucrose replacing supplements of alcohol. The comparative effects of alcohol and sucrose supplements upon the digestive processes were also studied by chemical examination of the feces of such paired rats." From the data reported the following conclusions are drawn:

"The energy of ethyl alcohol is to a large extent available for physiological purposes. Added to a complete diet, such as milk, it induces more rapid growth and a greater retention of nitrogen as well as of fat. The new tissue traceable to the alcohol supplement possesses a greater content of fat than that produced on the basal diet alone. The alcohol supplement does not increase the

excretion of metabolic products in the feces, but probably does increase the digestibility of the basal diet.

"As compared with a similar supplement of sugar, the energy of an alcohol supplement is only about three-fourths as available for physiological purposes, probably because of a greater specific dynamic effect. Its growth-promoting power is definitely less, though the composition of the new tissues produced is similar to that of the gains in weight produced by a sucrose supplement. Its effect on digestion is quite different from that of a sucrose supplement, the latter exerting no appreciable effect on the digestibility of the basal diet, but inducing a greater excretion of metabolic products in the feces in accordance with its content of dry matter."

A correction to certain of the computations in the main paper is made in the supplementary note.

[Vitamin investigations], E. Woods (*Idaho Sta. Bul. 220 (1936), pp. 34, 35*).—Included in this annual report are summaries of continued studies (E. S. R., 72, p. 137) on vitamin G in Netted Gem potatoes and on vitamin C in fresh, cold stored, and frozen prunes (E. S. R., 74, p. 132), and on the procedure for determining the vitamin G value of foods.

A biological appraisal of vitamins in the rural school child's winter diet, A. P. Brown (*Utah Acad. Sci., Arts, and Letters, Proc., 12 (1934–35), pp. 143–152, figs. 2*).—Food consumption records had been collected by the author at the Utah Experiment Station, as noted previously (E. S. R., 74, p. 417). A diet similar to the average diet taken by the school children was made up weekly and fed to guinea pigs and rats to test for vitamins.

Severe scurvy was produced in guinea pigs in from 3 to 4 weeks' time by use of the diet, indicating that numbers of the children might suffer from the latent or subacute form of the disease. Protection against scurvy in the guinea pig was given by daily additions of 3 cc. of orange or commercially canned tomato juice.

The dearth of vitamin C in the diets of these children is believed to have been due to lack of information or to indifference, since 17 fruits and vegetables known to be good sources of vitamin C were commonly grown in the counties in which these studies were made and can be canned and stored without materially destroying vitamin C.

The diet fed to rats maintained a slow steady growth, but was improved as indicated by growth with the additions of vitamins A and D, A, D, and B, and especially by A, B, D, and G.

The vitamin content of canned pineapple juice, N. B. Guerrant, R. A. Dutcher, F. S. Tabor, and R. Rasmussen (*Jour. Nutr., 11 (1936), No. 4, pp. 383–390*).—In this paper, a contribution from the Pennsylvania State College, pineapple juice was assayed by standard biological methods for its content of vitamins A, B, C, and G. It was found that 1 oz. of this juice contained approximately 30 Sherman units of vitamin A, 20 Sherman units of vitamin B, 2.5 Sherman units of vitamin G, and 40 international units of vitamin C. This assay shows pineapple juice to be a good source of vitamins A and B.

The relative vitamin A potency of carotene fed in butter fat and cottonseed oil, H. R. Kraybill and C. L. Shrewsbury (*Jour. Nutr., 11 (1936), No. 2, pp. 103–110, figs. 3*).—In this study from the Indiana Experiment Station, butterfat, decolorized with Lloyd's reagent until practically all color and vitamin A potency were removed, was tested as a carrier of carotene in comparison with refined cottonseed oil. Varying doses of carotene in the decolorized butterfat and in the cottonseed oil were assayed for vitamin potency.

It is concluded that carotene dissolved in the decolorized butterfat was not utilized as well as when it was dissolved in cottonseed oil, two or three times

as much carotene being required in the former to give equal vitamin A potency. It is pointed out that treatment of the butterfat with Lloyd's reagent removes the natural yellow pigments and vitamin A without noticeably destroying or removing the natural antioxidants. Data are also presented to show that hydroquinone, frequently used as an antioxidant, does not seriously interfere with the utilization of carotene from cottonseed oil.

Salivary secretion and the physiological mechanism of avitaminosis-A, H. C. CAMERON (*Amer. Jour. Physiol., 115 (1936), No. 1, pp. 210–214*).—In this study at the West Virginia Experiment Station, a slight temporary increase in salivary secretion, followed by a decrease, was noted in dogs with a salivary fistula during progressive stages of vitamin A deficiency when pilocarpine was used as a stimulus to secretion. Food when used as a stimulus caused very small changes in salivary secretion, indicating little or no change in the unconditioned reflex arc. Water consumption showed a temporary increase, followed by return to normal, particularly after the use of pilocarpine, suggesting a temporary central stimulation rather than a dehydrating effect due to avitaminosis A.

"Changes in salivary secretion are too small to serve as an index to circulatory or secretory changes occurring in avitaminosis A."

Cataract- and dermatitis-producing nutritional factors, A. F. MORGAN and B. B. COOK (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 2, pp. 281–285*).—Vitamin G (B_2) and lactose are the nutritional factors dealt with in this study to test the relation between absorption disturbances ascribed to these substances and the production of cataract, dermatitis, and growth abnormality. Four groups of rats were fed the usual vitamin-testing type of diet, one formula using cornstarch and the other lactose, to both of which vitamin G (B_2) was added where indicated.

On the cornstarch-vitamin G-low diet, the rats grew very little and developed a severe dermatitis. The constarch-vitamin G-rich dict prevented the development of dermatitis. No cataracts were noted in the animals fed on the cornstarch diet. The vitamin G-low lactose rats showed no skin or fur abnormalities but developed mature bilateral cataracts in from 21 to 35 days. On the lactose-G-rich diet cataracts formed in 85 percent of the rats, but after a long time, 60–84 days.

The authors conclude that "obviously the same deficiency cannot account for the dermatitis and the cataracts here reported. Whatever nutritional failure is caused by the lactose involves no dermatitis and indeed prevents it."

Further studies indicated that lactose, in contrast to cornstarch, either prevented absorption or caused a destruction of the cataract-preventing factor. Two groups of 2 rats on lactose-low G diets were given pure lactoflavine (vitamin G (B_2)) by mouth and by subcutaneous injection, respectively. Both groups developed cataract, but the 2 injected rats made better gains in weight, indicating some intestinal loss of the lactoflavine. Rats fed on a cornstarch-low G diet when fed or injected with pure lactoflavine increased in weight and were cured of dermatitis. This further indicates absorption disturbances caused by lactose.

Differentiation of the antidermatitis factor, A. G. HOGAN and L. R. RICHARDSON (*Science, 83 (1936), No. 2140, pp. 17, 18, fig. 1*).—This contribution from the Missouri Experiment Station is a continuation of studies previously noted (E. S. R., 72, p. 564).

The use of starch or the addition of 100 mg of an alcoholic extract of starch promptly healed the dermatitis which developed in rats on a basal diet supplemented with vitamin B (complex) carrier irradiated with ultraviolet light. Wheat-germ oil showed approximately the same activity,

Mazola and linseed oil were less effective, and coconut oil was entirely ineffective in curing the dermatitis. To show that the dermatitis-preventing factor was not identical with vitamin G, a flavine, a number of rats were given a diet supplemented with tikitiki, which healed the dermatitis but which produced in the rats in from 12 to 16 weeks extensive denuded areas. Wheat-germ oil, 100 mg daily, was ineffective to relieve the denuded condition, but 1 mg organic matter of a flavine preparation produced a new growth of hair in 2 weeks. Flavine preparations given to rats suffering from dermatitis did not cure this condition. The addition of both wheat-germ oil and flavine preparation to the diet produced normal appearance and normal growth.

These results indicated that two factors, an antidermatitis and flavine, are destroyed by ultraviolet irradiations in a vitamin B carrier containing all the members of the vitamin B complex. To determine whether the antidermatitis factor is destroyed by the visible spectrum, a water extract of yeast was exposed through plate glass to a 1,500-w Mazda bulb for 10 hr. at a distance of 10 in. This illuminated preparation prevented and cured dermatitis in rats. Since flavines are labile to the visible spectrum, 1 drop of the flavine preparation added to the diet containing the illuminated preparation produced normal growth.

Dietary production of specific syndrome of deficiency in vitamin B_6, N. HALLIDAY and H. M. EVANS (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 3, pp. 296–299*).—Recent difficulty in inducing in rats on the Sherman-Bourquin diet the specific dermatitis described by Chick et al. (E. S. R., 75, p. 137), György (E. S. R., 75, p. 282), and others suggested the possibility that the wheat extract used as a source of vitamin B_1 was contaminated with the factor responsible for the prevention of dermatitis. When the Sherman-Spohn diet was supplemented by vitamin B_1 crystals, the incidence of dermatitis was greater. Further modification of the diet by extracting the casein with hot 95 percent alcohol produced rough paws and inflamed toes in 35 percent of the rats in 2 weeks.

A preliminary report is given of experiments in which this diet supplemented only with vitamin B_2, or in addition with adsorbed material from alcoholic and aqueous extracts of brewer's yeast or with the adsorbed material from the aqueous extract of hog liver, was fed to rats. At the end of 5 weeks, 30 out of 35 of these rats showed "raw and edematous paws, swollen ears, and sores around the nose and mouth." Some rats died in 4 weeks. The yeast extract filtrate, autoclaved yeast extract filtrate, and the liver extract filtrate prevented this particular dermatitis, and sucrose substituted for the cornstarch in the diet did not produce it. The Sherman-Spohn diet modified by extracting the casein with hot concentrated alcohol and supplemented with B_1 crystals to remove vitamin B_2 more completely readily induced a dermatitis.

The vitamin B [B_1 and B_2 (G)] content of South Dakota lamb (muscle, liver, pancreas, thymus) and vitamin C content of liver, E. PIERSON (*South Dakota Sta. Rpt. 1935, pp. 30, 31*).—This investigation checked the work on vitamin B_1 (E. S. R., 73, p. 274), and determined the vitamin B_2 (G) content in lamb muscle, liver, heart, kidney, and tongue.

Marked progress made in vitamin C research, D. K. TRESSLER (*Farm Res. [New York State Sta.]. 2 (1936), No. 4, pp. 1, 7*).—This paper continues the studies noted previously (E. S. R., 73, p. 727) on the vitamin C content of spinach, peas, rhubarb, tomatoes, snap beans, and cabbage relative to factors which govern the vitamin content. The results showed that spinach, a nonacid vegetable, held at 70° F., lost half of its vitamin content in 3 days and its entire amount in a week. Refrigeration at 35° retarded the loss in spinach to

50 percent in 17 days. On the other hand, tomatoes and rhubarb, both acid vegetables, showed only slight losses of vitamin C at 70°. Variety affected the vitamin content as follows:

Small seeded early varieties of peas, such as Alaska, were richer in vitamin C than the large seeded later varieties, such as Alderman. Early Detroit and Golden Queen tomatoes were 50 percent more potent than other varieties. Georgian and Blue Lake snap beans contained only approximately one-half the amount of vitamin C found in Tendergreen, Kidney Wax, Ideal Market, and Kentucky Wonder. Princess Juliana and King of Denmark spinach were lower in vitamin C content than 10 other varieties grown at the station. On maturity the vitamin C content of peas decreased and that of tomatoes increased. Spinach grown in the autumn had higher vitamin C values than spring spinach. Upland soil produced higher vitamin C values in spinach than muck soil in both spring and autumn.

Cooking studies conducted on snap beans indicated that one-third of the vitamin C dissolved in the cooking water in 20 min., but the actual destruction of the vitamin was less than 10 percent of the total amount present. Blanching, a necessary procedure in preparing peas for freezing, resulted in a loss of vitamin C varying from 10 to 30 percent. Water blanching caused a slightly greater loss than steam blanching.

These results are discussed from the standpoint of their significance in public health.

Milk as a source of vitamin C, C. H. WHITNAH and W. H. RIDDELL (*Science, 83 (1936), No. 2146, p. 162*).—This note from the Kansas Experiment Station reports the protective quantity of fresh raw milk for a guinea pig to be 40 cc per day and of purified vitamin C to be an average of 1 mg per day. A liter of milk, therefore, contained 25 mg of vitamin C. Chemical tests totaling 502 determinations made on the milk of 55 cows representing four major dairy breeds showed the average value to be 25.9±4.3 mg vitamin C per liter. On the basis that the human requirement for vitamin C is from 19 to 27 mg daily, as estimated by Göthlin (E. S. R., 72, p. 886), fresh milk becomes an important source of vitamin C. Proper precautions in handling raw milk and milk pasteurized by the flash method were found to conserve the vitamin C content.

Some effects of experimental diets upon the vitamin C content of certain organs of the guinea pig (Cavia cobaya), I. GILLUM and M. M. KRAMER (*Kans. Acad. Sci. Trans., 38 (1935), pp. 205–207*).—In continuation of the investigation (E. S. R., 72, p. 886) on vitamin C at the Kansas Experiment Station, young guinea pigs were fed the Sherman, LaMer, and Campbell vitamin C-free diet supplemented daily with 5, 10, and 20 cc of orange juice per 300 g of body weight. At 8 weeks of age the animals were killed, and the tissue extracts were titrated for ascorbic acid content with 2,6-dichlorophenolindophenol.

The kidneys and adrenals showed a higher ascorbic acid value per gram of tissue with increased doses of orange juice. The heart remained constant in its ascorbic acid content. The adrenals were shown to be richest in vitamin C content.

The ascorbic acid content of certain organs of chicks raised on vitamin C deficient ration, H. C. HOU (*Science, 82 (1935), No. 2131, p. 423*).—It is noted that in chicks fed on a vitamin C-free diet both with and without ultraviolet irradiation the adrenals, liver, intestines, and intestinal mucus all possess a high content of ascorbic acid, while the pancreas and kidneys contain lesser amounts and the muscle tissue is entirely devoid of this product. Traces were found in the contents of both the small and large intestines, indicating an excretion of ascorbic acid through the intestinal wall.

Further studies pertaining to provitamin D of plant and animal sources, R. M. BETHKE, P. R. RECORD, and O. H. M. WILDER (*Jour. Biol. Chem., 112 (1935), No. 1, pp. 231–238*).—The observation of Waddell, noted previously (E. S. R., 72, p. 888), that the provitamin D of cholesterol and ergosterol was not identical was checked in this investigation at the Ohio Experiment Station on both chicks and rats receiving cod-liver oil, irradiated cholesterol, irradiated ergosterol, and a variety of irradiated animal and plant products as a source of vitamin D.

The data showed that the vitamin D of irradiated cholesterol is more efficacious in preventing rachitic manifestations in the chick than that of irradiated ergosterol or calciferol, which were found to be of the same order of efficiency. The vitamin D of irradiated cholesterol equaled that of cod-liver oil for chicks. The irradiated animal products were more potent antirachitically for chicks than the irradiated plant products when these were fed at equivalent rat units.

These data led to the conclusion that the provitamins of animal and plant products are not identical. There was found to be no difference between the vitamin D of irradiated products from higher plants and that from the lower botanical order.

The effect of organic dietary constituents upon chronic fluorine toxicosis in the rat, P. H. PHILLIPS and E. B. HART (*Jour. Biol. Chem., 109 (1935), No. 2, pp. 657–663, fig. 1*).—In continuation of investigations noted previously (E. S. R., 71, p. 565), carried on at the Wisconsin Experiment Station, the authors gave evidence that fluorine toxicosis was not prevented by a diet low in carbohydrate and high in fat, with the addition of 0.2 percent of sodium fluoride, except to the extent that the high energy value lowered the daily intake of food and consequently the intake of fluorine. The addition of 9 parts each of calcium lactate, potassium and sodium lactate, and lactic acid or glycerol to this diet did not alleviate the toxicity.

A complete inhibition of growth resulted when rats were fed a natural grain diet with the addition of from 78 to 84 mg sodium fluoride per kilogram of body weight. Young rats could not tolerate more than from 6 to 7 mg of fluorine per day. Growth was resumed when fluorine was removed from the diet.

"These data are interpreted to mean that chronic fluorine poisoning involves more than a mechanism responsible for carbohydrate metabolism. The mode of action of F, viewed as a systemic reaction involving enzymatic inhibition, is discussed."

The effect of fluorine upon the phosphatase content of plasma, bones, and teeth of albino rats, M. C. SMITH and E. M. LANTZ (*Jour. Biol. Chem., 112 (1935), No. 1, pp. 303–311*).—In continuation of investigations noted previously (E. S. R., 74, p. 427) carried on at the Arizona Experiment Station, the authors show that plasma phosphatase values of normal control rats on the Sherman diet B decreased with age, reaching a minimum in 70 days, and continued at that value with little change. The plasma phosphatase values of rats on the diet with 0.1 percent sodium fluoride decreased with age, but more slowly, and increased slightly after 70 days. These results are believed to be an indication of stunted bone growth and delayed maturity rather than a specific fluorine effect. The rats receiving 0.025 percent sodium fluoride in the diet, sufficient to cause mottling of teeth but not stunting in bone growth, showed phosphatase values of the same order as that in control animals. The phosphatase content of the incisor teeth was slightly higher in the controls than in the rats receiving 0.1 percent sodium fluoride. It had previously been shown that fluorine inhibited the rate of eruption of these teeth (E. S. R., 72, p. 726). Bone phosphatase values were the same for control and fluorine-fed rats up

to 70 days, after which the values were slightly higher for the latter. Adult rats receiving injections of 0.3 cc of a 2.5 percent sodium fluoride solution showed approximately the same plasma phosphatase values as the controls.

The authors conclude that fluorine does not damage the teeth of rats through its effect on the phosphatase occurring in tooth and bone calcification, and that there was no increase in plasma phosphatase, as had been noted in dairy cows by Phillips (E. S. R., 69, p. 414).

Mottled teeth: An experimental and histologic analysis, I. SCHOUR and M. C. SMITH (*Jour. Amer. Dental Assoc., 22 (1935), No. 5, pp. 796–813, figs. 12*).—Microscopic studies were made on the enamel and dentine of the incisors to determine histologic changes obtained by single or multiple injections of from 0.1 to 0.9 cc of 2.5 percent sodium fluoride solution in 32 rats from 90 to 270 days old. Microscopic examination was also made of the incisors of 16 litter mates used as controls. Detailed findings are given of a number of representative animals showing the response in the enamel and dentine to the fluorine injections. After each injection both the enamel and dentine show a pair of light and dark incremental layers which approximate 32μ for injections given at 48-hr. intervals and 16μ for injections given at 24-hr. intervals. The light layers arising at the time of injection are imperfect in formation and in calcification, and, on the other hand, the dark layers representative of recovery are normal in formation with normal or excessive calcification. These incremental layers occurred when the single dosage was large or with multiple injections of more than 5 at 24-hr. intervals.

The earliest disturbances were observed when animals receiving 0.3 cc of 2.5 percent sodium fluoride were killed 1 hr. after administration. "These changes are recognized in the posterior region of the incisor within the ganoblastic layer in the form of an abnormal character and distribution of globules. In addition, the incremental surface of the organic enamel matrix lacks its normal arrangement and is covered with hemispherical globules that stain deeply with hematoxylin in the animals that were allowed to live from 12 to 24 hr. after the administration." This investigation offered a method of measuring the growth in continuously growing teeth by injections of fluorine. It also gave evidence that the rate of growth of a rat incisor is approximately 16μ in 24 hr. It is believed that fluorosis affected the enamel forming cells directly and not through disturbances in the blood calcium and phosphorus, or in the parathyroids. Twelve microphotographs of sections of incisors are given and explained.

The occurrence of mottled enamel on the temporary teeth, M. C. and H. V. SMITH (*Jour. Amer. Dental Assoc., 22 (1935), No. 5, pp. 814–817, figs. 4*).—The findings in this paper have been essentially noted (E. S. R., 74, p. 427.)

Further studies in mottled enamel, M. C. SMITH, E. M. LANTZ, and H. V. SMITH (*Jour. Amer. Dental Assoc., 22 (1935), No. 5, pp. 817–829, figs. 9*).—In continuation of the studies noted above, a survey showed that in 45 towns or rural districts in Arizona all of the native born children had mottled enamel due to the presence of fluorine in the water supply in concentrations of from 1 to 6 p. p. m. The severity of the mottling varied with the concentration of fluorine in the water. Exceptions were found in people not native born and intermittent users of fluoride-containing water. Since fluorine is widely distributed in minerals occurring in rocks and soils, mottled teeth have been reported in 23 States in the United States and in all the continents except Australia.

Data were included on quantitative studies of the diets of 16 children with mottled teeth and diets of children who were free from this dental defect. The protein and energy content of both diets was adequate, as was calcium, which averaged 1.15 g daily for children with mottled enamel and 1.18 g daily for

those without. A daily vitamin D supplement of cod-liver oil or 250 D viosterol during the school year for 3 yr. between the ages of 6 and 9 yr. did not prevent mottling of the permanent first molars and the central and lateral incisors. These findings were true also in rats fed on rations containing 0.025 percent fluoride and supplemented with cod-liver oil or viosterol.

Experiments were conducted on calcium and phosphorus balances with rats and with dogs fed fluorine in their ration and with children who drank water containing fluorine. The rats fed 0.1 percent fluorine retained 50 percent less calcium and less than 50 percent as much phosphorus as their control litter mates. Fluorine retarded the bone development and rate of eruption of the incisor teeth. The fluorine-fed dogs showed a lowered retention of calcium and phosphorus, although the differences were less striking than in the rats. The girls who lived in districts in which the concentration in drinking water was approximately 4 p. p m. showed no significant or consistent differences in retention of calcium and of phosphorus as compared to control girls living in communities free from the dental defect. The results obtained by adding sodium fluoride, cryolite, calcium fluoride, and barium fluosilicate to the diet of rats to determine the effect on the growth rate of the teeth and on the mortality showed that sodium fluoride was toxic in concentrations of 0.0226 percent of the ration, and that the less soluble compounds had much less toxic effects. Sodium fluoride fed in concentrations of 0.0904 percent of fluorine was fatal, while a daily intake of 10 times as much fluorine in the form of cryolite was not fatal.

Fluorine used in insecticides is discussed from the standpoint of public health.

Mottled enamel in the Salt River Valley and the fluorine content of the water supplies, H. V. and M. C. SMITH and E. O. FOSTER (*Arizona Sta. Tech. Bul. 61 (1936), pp. 372–418, figs. 7*).—In continuation of the series of studies noted above, this investigation included an analysis of the waters for fluorine content in districts of the Salt River Valley and a survey to determine the incidence of mottled enamel among school children in each school district. A map of the townships investigated shows the distribution of fluorine in well water. The territory north and east of Phoenix and that north of the Salt River Mountains had water high in fluorine content, while the territory north and west of Glendale had water generally low in fluorine content. In other areas wells in the same or adjoining sections had either low or high fluorine content in the water. Accompanying tables gave the number and locations of the wells tested in each township.

Analysis of the central water supplies of 11 cities in the Salt River Valley showed the fluorine content to be below the toxic level. Children in these city schools with mottled enamel were users of private wells supplying water with high fluorine content. In the rural section, over one-third of the children had mottled enamel in 17 school districts. In the Squaw Peak and Camelback district, a highly populated area, 57 percent of the children attending school had severely mottled teeth, and an analysis of the water showed it to contain from 12 to 18 p. p. m.

Concentrations of fluorine of from 0 to 0.8 p. p. m. in the water produced no noticeable effect on children's teeth, 0.9 part produced very mild mottled enamel, from 1 to 2 parts produced mild to moderate mottled enamel, from 2 to 3 parts produced moderately severe mottled enamel, from 3 to 6 parts produced severe mottled enamel, and 6 or more p. p. m. produced severe pitting and chipping and deciduous teeth were affected. Water with concentrations of from more than 8 to 10 p. p. m. was found to be unsafe for cooking purposes.

The solution for preventing the occurrence of mottled teeth was avoidance of the use of drinking water containing concentrations of fluorine above 0.9 p. p. m.

Suggested methods for providing safe drinking water were connection with city water mains or hauling city water in bottles, obtaining water from a nearby nontoxic well, deepening or casing existing wells or by drilling new deep wells, and the use of commercially bottled or distilled waters tested as free from fluorine. No satisfactory method of removing fluorine by chemical means from water supplies has been developed.

The fluorine content of some Chinese food materials, E. Reid (*Chin. Jour. Physiol., 10 (1936), No. 2, pp. 259–271, figs. 6*).—Referring to the work of Smith et al. noted above, the author presents data obtained by fluorine analyses of several Chinese food materials, especially those grown in areas where mottled enamel was prevalent or where fluoride deposits occurred. Teas in general, but especially Chinese teas, were found to be high in fluorine content. One Chinese tea grown in a fluorite mining area contained 175.78 mg per 100 g of dry substance. Two percent infusions of several varieties of teas extracted between 81 and 96 percent of the fluorine in the tea in 5 min. Young rats fed rations including tea to the extent of 5 and 10 percent showed white and dark striations in the enamel of the incisors. Analyses of cereals, legumes, roots and tubers, coffees, Chinese wines and citrus fruit juices, and leafy vegetables showed these to be relatively lower in fluorine content. Leafy vegetables in general were higher than seeds and roots. The foods grown in the fluorite mining area gave little evidence that the plants assimilated fluorine from the soil. The exceptions were salted mustard leaves and salted turnip, which may have been due to the fluorine in the salt added to these vegetables. The use of tea as a cause of mottled enamel occurring in China is discussed.

Fluorine in relation to bone and tooth development, F. DeEds (*Jour. Amer. Dental Assoc., 23 (1936), No. 4, pp. 568–574, figs. 5*).—This paper, presented at the 1935 meeting of the California State Dental Association, consists chiefly of a discussion of the literature on the subject, including previous work of the author (E. S. R., 71, p. 726). In addition, a comparison of the bone phosphatase of fluorine-fed rats showed a decreased activity from that of control rats. This effect of fluorine was duplicated in vitro by hydrolysis of sodium glycerophosphate in the presence of sodium fluoride from rat molars.

Relation of certain aciduric bacteria and certain food elements to dental caries, D. C. Lyons (*Jour. Amer. Dental Assoc., 22 (1935), No. 3, pp. 409–421, figs. 6*).—In this investigation a number of experiments were conducted to ascertain the effect of cultures of bacteria obtained from the human decayed tooth and of diets deficient in vitamins on the teeth of rats. Cultures taken from decayed teeth of approximately 500 persons showed predominance of *Lactobacillus acidophilus* for patients between the ages of 1–30 yr., followed by a predominance of flagellated bacilli and streptococci in later years. The gum tissues and impacted food presented a mixture of yeasts, fungi, and bacteria. Cultures of these bacteria were added to sterilized, adequate diets given to rats housed in sterilized cages and individual compartments. After 8 weeks the rats were etherized, examined for dental caries, and cultures made from decayed areas, gum tissues, and impacted foods. Dental decay developed in every instance. Cultures of bacteria recovered from the mouths of these rats were added later to the food of a second group of rats, but dental caries did not develop in all instances. Rats receiving *L. acidophilus* showed no dental decay, but had loosely formed feces, indicating possible contamination of the culture with putrefactive organisms. These results suggested the possibility of the antibiotic relationship of oral flora having an effect upon tooth decay.

The results of feeding to rats diets deficient in vitamins A, B, D, and G, and a miscellaneous diet showed no marked tooth decay.

TEXTILES AND CLOTHING

The influence of various kinds of wool on some of the physical properties of flannel, E. PIERSON (*South Dakota Sta. Rpt. 1935, pp. 31–33*).—This comparative study of wool from five different breeds of sheep used the wool for filling threads in flannel woven expressly for the purpose. Analyses are given for both dyed and undyed material.

The consumer wonders how to judge wool fabrics—tests show only shrinkage related to price, E. L. PHELPS (*Textile World, 84 (1934), No. 12, p. 2228; abs. in Minnesota Sta. Rpt. 1935, p. 46*).—This is an abstract of a paper prepared from material previously noted (E. S. R., 73, p. 732) for the use of the American Society for Testing Materials. The number of woolen fabrics studied, their physical properties, and the significant relationships between price per square yard and the factors measured are given. A criticism of the grab test for measuring tensile strength and some observations on the serigraph test are included.

Silk weighting, M. CHINN and E. L. PHELPS (*Indus. and Engin. Chem., 27 (1935), No. 2, pp. 209–211, figs. 3; abs., in Minnesota Sta. Rpt. 1935, p. 25*).—The first step in the metallic weighting of silk fabrics was studied at the Minnesota Experiment Station, using a series of stannic chloride solutions of increasing concentrations. The optimum concentration for weighting was indicated as 1.2750 sp. gr., with a 10.57 percent maximum retention of weighting on the silk. The retention of weighting by the silk from stannic chloride solutions of lower concentrations was shown to be a positive adsorption reaction, while that with higher concentration was a negative adsorption reaction. The amount of weighting retained was similar for the lowest and highest concentrations of stannic chloride solutions used. The difference in total amounts of weighting retained and the stannic oxide found in the samples was assumed to be due to the effect of a new equilibrium reached in the rinsing bath in combination with positive and negative adsorption. Weighted silk adsorbs approximately the same amount of moisture (8.6 percent) under standard temperature and humidity regardless of the amount of weighting present.

A study of clothing costs for a freshman girl, H. K. ROBSON (*Jour. Home Econ., 28 (1936), No. 1, pp. 30, 31*).—The clothing costs presented for 44 freshman college girls show that an average of $108.93, with a range of from $6.93 to $564.74, was spent for new fall clothing, an average of $51.25 for additional clothing during the first semester, and an average of $9.48 for upkeep and personal grooming. Cost figures were also presented for certain clothing items.

HOME MANAGEMENT AND EQUIPMENT

[Standard of rural living in Montana] (*Montana Sta. Rpt. 1934, pp. 42, 43*).—Summaries are included of studies on the cost of a satisfactory standard of rural living, on contributions from the farm to family living, on the improvement of the quality of the food produced on the farm for family use, and on the preservation of the food produced on the farm for family use.

Electric refrigeration and air conditioning (*Lubrication, 22 (1936), No. 6, pp. 61–72, figs. 19*).—This is a technical discussion of different types of home refrigeration.

MISCELLANEOUS

Laws applicable to the United States Department of Agriculture, 1935, compiled by J. P. WENCHEL and M. E. MOORE (*U. S. Dept. Agr., 1936, pp. XXII+750*).—This supersedes the work previously noted (E. S. R., 53, p. 299), embracing acts and provisions of a permanent character in force on September 6, 1935.

Annual Report [of Florida Station], 1935, W. NEWELL ET AL. (*Florida Sta. Rpt. 1935, pp. 152+VIII, figs. 12*).—The experimental work not previously referred to is for the most part abstracted elsewhere in this issue. Meteorological observations in the Everglades (pp. 102–105) and at the North Florida Substation at Quincy (p. 133) are also included.

Science aids Idaho farmers: The Annual Report of the [Idaho] Agricultural Experiment Station for the year ending December 31, 1935 [E. J. IDDINGS ET AL.] (*Idaho Sta. Bul. 220 (1936), pp. 62, figs. 17*).—The experimental work not previously reported is for the most part noted elsewhere in this issue.

Forty-eighth Annual Report of the [Michigan Station], 1935, V. R. GARDNER ET AL. (*Michigan Sta. Rpt. 1935, pp. 151–239, figs. 3*).—The experimental work not previously reported is for the most part noted elsewhere in this issue. Analyses of vinegar (pp. 203, 204), bacterial studies on the quality of swimming-pool waters (pp. 204–207) and cost studies for beans, potatoes, and beef production (pp. 222, 223) are also included.

Forty-second Annual Report [of Minnesota Station], 1935, A. Boss (*Minnesota Sta. Rpt. 1935, pp. 89*).—In addition to data noted previously or elsewhere in this issue, this report contains abstracts of the following: Physiology of the Adaptation of Plants to Low Temperature, by R. B Harvey (p. 20); Power From the Prairie, by C. H. Bailey (p. 26); Two New Bird Ceratophylli From Minnesota (Insecta: Siphonaptera), by C. Y. Liu (p. 41); Making Hay With the Windrow Baler, by A. J. Schwantes (p. 45); The Economics of Long-Lived Farm Structures, by W. Boss (p. 46); Shelterbelt Planting Revealed in Early Minnesota Forestry, by H. Schmitz (p. 47); The Vitamins: A Discussion of Some Aspects of Past and Present Knowledge, by L. S. Palmer (p 47); and Edible Fruits From Minnesota Wild and Cultivated Plants, by L. Sando (p. 47).

Reshaping Montana's agriculture: The Forty-first Annual Report of the Montana Agricultural Experiment Station, [1934], F. B. LINFIELD (*Montana Sta. Rpt. 1934, pp. 83, figs. 14*).—In this report the current agricultural situation is discussed, and the opportunities and responsibilities of the station are outlined. A meteorological report for 1934 is included (pp. 77–80). The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fifty-sixth Annual Report of the New Jersey State Agricultural Experiment Station and the Forty-eighth Annual Report of the New Jersey Agricultural College Experiment Station for the year ending June 30, 1935, J. G. LIPMAN (*New Jersey Stas. Rpt. 1935, pp. XXIII+122, fig. 1*).—The experimental work not previously referred to is for the most part abstracted elsewhere in this issue.

Annual Report of the South Dakota Agricultural Experiment Station, [1935], J. W. WILSON ET AL. (*South Dakota Sta. Rpt. 1935, pp. 48*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

Louisiana University and Station.—Dr. W. R. Dodson, until 1928 dean of the College of Agriculture and director of the station and subsequently in charge of animal husbandry work at the U. S. D. A. Iberia Livestock Experiment Farm, has returned to the department of agronomy for teaching and extension work. The honorary D. Sc. degree was conferred upon him by the university on August 6 in recognition of his long service "to the youth of the State of Louisiana as a teacher and leader in agriculture, as an organizer of forces for the development of better agricultural conditions in the South, and for launching the movement that resulted in the establishment of the . . . university on its present site."

Missouri University.—The College of Agriculture has enrolled 720 students in agriculture and home economics. This is the largest number in its history and more than double that of 3 years ago.

Cornell University and Station.—Dr. Oskar A. Johannsen has been appointed head of the department of entomology vice Dr. J. G. Needham, who retired July 1. H. C. Troy, professor of dairy industry, also retired July 1. Dr. Vernon Frampton has been appointed assistant professor of plant pathology for work on the chemical nature and control of virus diseases. Glenn W. Hedlund, extension instructor in marketing, has been granted a year's leave of absence to teach farm management and cooperative marketing in Nanking, China.

New York State Station.—One of the very few successful attempts to hybridize pumpkin and squash has been made by the station, about a dozen fruits being obtained from more than 100 cross-pollinations. These new plant forms have thrown considerable light on the botanical relationships of squashes and pumpkins, and are also of interest to the vegetable grower since the new varieties seem to be either immune or highly resistant to squash mosaic.

Clemson College and South Carolina Station.—Dr. H. P. Cooper, head of the department of agronomy, has been appointed director of the station, effective July 1.

Joseph N. Harper, head of the department of agriculture in the college and director of the station from 1905 to 1917 and widely known throughout the South, died in Atlanta, Ga., on July 1 at the age of 62 years. Born in Mississippi and graduated from the Mississippi College in 1895, he was appointed agronomist in the Kentucky Station in 1898 and received the M. S. A. degree from the University of Kentucky in 1906. Since leaving South Carolina he had been engaged in commercial work for various fertilizer interests.

Wisconsin Station.—An extensive program of research on potatoes has been begun with the objective of better quality. Potatoes from many parts of the United States, Central and South America, and Europe are to be assembled for breeding work to be carried on near Port Wing on the shores of Lake Superior. The program will be conducted under the supervision of a committee representing breeding, disease resistance, and adaptation studies and will include physiological, chemical, soils, and insect investigations. The field work, as well as greenhouse trials in Madison, will be in charge of Dr. G. H. Rieman, who has been head of plant breeding work for a large vegetable seed producing organization.

EXPERIMENT STATION RECORD

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DR. TRUE'S HISTORY OF AGRICULTURAL EXPERIMENTATION AND RESEARCH

The invaluable trilogy of monographs of agricultural education, extension, and research, preparation of which was begun by the Federal Department of Agriculture about a decade ago, will soon be completed by the issuance of the third and final member of the series. This is entitled A History of Agricultural Experimentation and Research in the United States, 1620–1925, and will appear as Publication 251 in the Miscellaneous Series of the Department. Like its predecessors it is from the pen of Dr. A. C. True, the manuscript having reached substantial completion upon his death in 1929.

The primary purpose of the series—the presentation of a comprehensive summary of factual information—has been consistently adhered to, so it is not surprising that the publication extends over some 300 pages and contains a wealth of detail. As in the preceding monographs, considerable space has been given to examples of the work of private individuals and organizations in laying the foundations for the establishment of public agencies for agricultural research. However, after the passage of the Hatch Act for the maintenance of State experiment stations and the elevation of the Federal Department of Agriculture to Cabinet rank, the work of these agencies spread out so broadly that in the recapitulation of the past half century a more extensive basis of treatment was found necessary, and little has been attempted beyond describing the organization and equipment of their research and its general character and breadth.

Following a discussion of beginnings in the days of the colonies and early statehood, there has been substituted in lieu of a strict chronology of all agricultural research more or less of a differentiation of that conducted directly by the Federal Government and that carried on by the State experiment stations and other agencies. Sections are set up taking in turn the work of the Federal Government under the Patent Office and by the Department of Agriculture prior to 1889; the movement in the States toward the establishment of

agricultural research institutions, 1840–75; State agricultural experiment stations without Federal aid, 1875–88; agricultural experiments in States not having experiment stations, 1875–88; the Hatch Act and the stations thereunder, 1888–1905, and the movement for increased aid culminating in the Adams Act, 1902–6; the Department from 1889 to 1897; development of research in agricultural production, 1897–1913, by the Department and the stations; the development of research in agricultural economics and sociology, 1913–21; agricultural experiment stations as affected by the Smith-Lever Extension Act and the World War, 1914–20; and agricultural research during the agricultural depression, 1921–25, by the Department and the stations. The history closes with the enactment of the Purnell Act of 1925.

This method of treatment has the advantage of concentrating attention on significant movements with a minimum of dilution by nonrelevant occurrences. It has the corresponding disadvantage of separating many events of contemporaneous date and of creating some duplications of treatments as well as some uncertainty as to where specific happenings have been discussed. These drawbacks are overcome to some extent by frequent cross-references and a comprehensive index.

Needless to say the material included has been selected, assembled, and evaluated with meticulous care, and from the point of view of its preservation in available form this alone would constitute an achievement abundantly worth-while. The monograph, however, is much more than a compendium of data. Great pains have been taken to discover and analyze causes and trends and to present the underlying philosophy of the movement as completely as possible within the space limitations. This is particularly the case as regards the evolution of the experiment stations. For this task Dr. True was, of course, exceptionally well fitted by temperament and experience.

The appearance of this authoritative monograph will be welcomed by all who are interested in the growth of American research institutions for agriculture. It has been long needed and will fill a unique place as a work of reference and orientation, and should be especially useful as a repository of source material. Perhaps it may serve as a starting point and activator for a more popular and dramatic treatment under other auspices of some of the myriad individual matters with which it has to deal.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The proteins of the cowpea (Vigna sinensis), W. H. ADOLPH and H. C. CHIANG (*Chin. Jour. Physiol., 9 (1935), No. 4, pp. 347–353*).—The pale reddish seeds of *V. sinensis sesquipedalis* were finely ground and analyzed by the Van Slyke method for the purpose of isolating previously unidentified protein fractions.

One kg of the cowpea meal was treated with 5 l of water, stirred for 3 hr., and allowed to stand overnight in a cold place. The liquid was separated by decantation and with a filter press, treated with ammonium sulfate to 0.7 saturation, allowed to stand overnight, and filtered. The precipitate was redissolved in water, dialyzed, filtered from traces of globulin, and the filtrate heated to 66° [C.] on a water bath. This process yielded 17 g of a coagulated protein which was termed an albumin. The filtrate obtained by this procedure was diluted with 3 volumes of water and heated to 73°. The coagulated protein was termed globulin B and yielded 11 g. The filtrate was again heated to 90° and the coagulum was termed globulin C. The yield was 2.5 g. All these fractions were purified by washing and drying in the usual way.

The residue from the water-extracted cowpea meal was treated with 5 l of 8 percent sodium chloride, and vignin (globulin A) was precipitated from the filtrate by dilution with 7 volumes of water. The yield was 60 g. The residue left by this procedure was treated with 5 l of 0.2 percent sodium hydroxide and left overnight. The liquid was separated and treated with sodium chloride to give a concentration of 5 percent with respect to this salt and made acid to litmus and neutral to congo red by adding hydrochloric acid. The resulting precipitate was termed a glutelin and the yield was 34 g of the purified protein.

Analysis was made of the five protein fractions to determine the carbon, hydrogen, oxygen, and sulfur content. Estimates of the relative percentages were vignin (globulin A) 45 percent, glutelin 25, albumin 15, globulin B 10, and globulin C 5 percent. The glutelin and albumin were believed previously unidentified. Amino nitrogen analysis on four of the protein fractions showed the glutelin to be high in cystine and the globulins and albumin to be high in lysine.

Effect of different buffers and type of substrate on the diastasis of wheat starch, C. E. MANGELS and J. J. MARTIN, JR. (*Cereal Chem., 12 (1935), No. 5, pp. 256–268, figs. 4*).—This investigation, made at the North Dakota Experiment Station, determined the effect of three buffer solutions, McIlvaine's citric acid-sodium phosphate buffer (pH range 2.2–8.0), Walpole's acetate buffer (pH range 3.6–5.6), and Sørenson's phosphate buffer (pH range 5.3–8.0), on the diastatic activity of wheat flour and pure raw starch.

Wheat flour produced more maltose in 60 min. with Sørenson's phosphate buffer than with the other two buffers. The optimum point of diastatic activity for McIlvaine's buffer was pH 5.0, for Sørenson's buffer pH 5.2–5.6, while Walpole's buffer did not show an optimum point for wheat flour. Pure raw

starch substrate, with malt and takadiastase as a source of enzyme, shifted the optimum point to the alkaline side, McIlvaine's buffer showing a greater shift than Sørenson's phosphate buffer. Cooked starch substrate with malt and takadiastase as the source of the enzyme tended to shift the optimum point to the acid side as compared with raw starch. Wheat flour and pure raw starch as substrates formed practically the same amounts of maltose. On the other hand from 60 to 70 percent of cooked starch with malt diastase was converted into maltose, while only 2 percent of raw starch was converted by the same quantity of the enzyme. This difference in sugar formation was so large that results with cooked starch were of no value in predicting the diastatic susceptibility of raw starch. For the determination of diastatic activity of wheat flour doughs, it was found important to have the starch substrate similar to the natural starch of the wheat flour.

Hemicellulose constituents in alfalfa roots, B. A. BURKHART (*Plant Physiol., 11 (1936), No. 2, pp. 421–428*).—In this study at the Wisconsin Experiment Station, the hemicelluloses of the root phloem and xylem tissues soluble in 5 percent NaOH were isolated, purified, and analyzed, falling into two main fractions, an acid-insoluble one (hemicellulose A) and an acid-soluble, alcohol-insoluble one (hemicellulose B). Using Fehling's solution, hemicelluloses A–2 and B–2 were also obtained. The chief sugars in all fractions were *d*-xylose and *d*-glucose, but some *d*-glucuronic was also present. The most significant variation between the phloem and xylem hemicelluloses was the higher xylose content in the latter. The content of *d*-glucuronic acid was highest in the phloem hemicellulose.

Colloid chemistry of cellulosic materials, A. J. STAMM (*U. S. Dept. Agr., Misc. Pub. 240 (1936), pp. 91*).—The author states that he has not undertaken a review of all researches on the colloidal properties of cellulosic materials and that the appended bibliography (280 citations) is "far from complete." He "has attempted more to tie together salient findings regarding the more important colloidal properties of the cellulosic materials. . . .

"The colloid chemistry of cellulosic materials is now at the stages of transition from a qualitative to a quantitative science. Further researches directed toward the determination of the quantitative interrelationship of the various colloidal properties will make possible a more intimate understanding of the physical nature of cellulose which, in turn, will undoubtedly strengthen its claim to being the world's most important organic raw material."

Microscopical phenomena in emulsifying and breaking cresoap emulsions of petroleum oils, P. A. YOUNG (*Amer. Micros. Soc. Trans., 55 (1936), No. 2, pp. 260–274, pl. 1, figs. 5*).—Microscopic studies conducted at the Montana Experiment Station resulted in the identification of the structures and explained the formation of cresoap emulsions of petroleum oils in water. When a cresoap-miscible oil touched water, emulsification quickly occurred, mainly by the following methods: "Continuous phase water and oil formed a partial interface. Jets of oil flowed through temporary holes in this interface and dispersed myriads of oil globules in the water. Oppositely rotating pairs of horizontal currents in the oil and water beside the interface, and vertically rolling cylindrical currents in the oil beside the interface, apparently drove masses of liquids through the interface and helped to disperse spheres of oil and water. The interface curved and made knobs many of which abstricted spheres of emulsion into the continuous phases.

"When petroleum oil containing Oil Red O and cresoap touched water containing methylene blue, the methylene blue mixed with the cresoap to form dark blue spheres as a separate phase dispersed in oil and water. The other

phenomena of emulsification were like those in unstained oil and water. Six stable phases and four unstable phases were described in emulsions with oil, cresoap water, and methylene blue."

Besides simple oil globules, spray emulsions contained dispersed globules of emulsions. The phenomenon of positive adsorption of solutes at interfaces was demonstrated visibly with cresoap. Potassium bromide and sodium chloride each caused rapid coalescence of oil globules in emulsions. Also, dextrose and sucrose caused slow breaking of emulsions in test tubes.

Studies on biological oxidations.—V, Copper and hemochromogens as catalysts for the oxidation of ascorbic acid. The mechanism of the oxidation, E. S. G. BARRON, R. H. DEMEIO, and F. KLEMPERER (*Jour. Biol. Chem., 112 (1936), No. 2, pp. 625–640, figs. 5*).—In this study on the oxidation of ascorbic acid, extreme care was taken not to contaminate solutions with copper by chemicals and apparatus.

Ascorbic acid was oxidized by a current of air at 25°C. when the experiment was performed at a pH value of 7.60 or above. As the rate of alkalinity increased from pH 8 to pH 10 the rate of oxidation increased. The oxidation proceeded until 1 atom of oxygen had been used for each molecule of ascorbic acid, resulting in oxalic acid and *l*-threonic acid.

Copper, as $CuCl_2$, in concentrations of 46 mg per liter had a catalytic action on the oxidation process when performed in alkaline, acid, and neutral solutions. The maximum rate of reaction with copper as a catalyst occurred at pH 6.95; below that pH the rate of oxidation slowed rapidly. Manganese, iron, nickel, cobalt, and calcium and also hemin had no catalytic effect on the oxidation process. Three hemochromogens, nicotine, pyridine, and pylocarpine, were found to act as catalysts.

Oxidized ascorbic acid was completely reduced by H_2S up to pH 5.0, and above this pH to pH 7.6 it was partially reduced. No reduction was detected using hydrogen in the presence of colloidal palladium.

A change of 10° in temperature had little effect on the oxidation process. The temperature coefficient for the oxidation of ascorbic acid, using copper in the ratio of 1 part $CuCl_2$: 100 parts of ascorbic acid as catalyst at from 27° to 37° at pH 3.17, was found to be 1.65.

The electromotive measurements of the hemochromogens (unpublished work) showed that as the oxidation reduction potentials became more positive the catalytic power increased.

The procedure and mechanism of the oxidation of ascorbic acid by atmospheric oxygen in the presence of catalytic agents are discussed.

Ascorbic acid in the urine [trans. title], F. WIDENBAUER (*Klin. Wchnschr., 15 (1936), No. 3, pp. 94, 95*).—Determining the ascorbic acid content of 8 urines, the author obtained lower values with the indophenol method of Harris and Ray than those obtained with the iodine titration method and, therefore, concluded that the indophenol method was more but not absolutely specific in its reaction. The relative accuracy of the two methods was further determined by titrating solutions of pigments obtained from the urine by absorption with animal charcoal and extracted by successive treatments with ammoniacal alcohol and absolute alcohol. Water solutions of these native pigments, dark brown in color, strongly reduced indophenol and iodine solutions. Preparations of urochrome A and B were made and rendered free from ascorbic acid. Water solutions of these pigments yielded an average value of 0.104 mg ascorbic acid with the indophenol method and 0.352 mg with the iodine method. These results indicated that for a daily excretion of 1,000 cc of urine reducing values of 4.16 and 14.08 mg calculated as ascorbic acid could be obtained without the presence of ascorbic acid in the urine.

To further examine methods for vitamin C determination in the urine, the test dose method of Harris and Ray (E. S. R., 73, p. 427), which determined the state of vitamin C nutrition, was applied to two infants. One receiving 1,000 mg of ascorbic acid gave a maximum response of 35.15 mg ascorbic acid excreted in the urine and the other receiving 150 mg excreted 44.5 mg. Since the amounts excreted by both infants before and after the test doses were given differed but little, it must be concluded that the vitamin C economy was quite different for the two children, indicating the importance of using the test dose.

The demonstration of vitamin C (ascorbic acid) in the urine [trans. title], A. EMMERIE and M. VAN EEKELEN (*Klin. Wchnschr., 15 (1936), No. 10, p. 348*).—This note corrects an error in the paper by Ammon and Hinsberg noted above in which lead acetate was used instead of mercuric acetate in the modified 2,6-dichlorophenolindophenol procedure previously described by the authors (E. S. R., 73, p. 583). Lead acetate was shown to precipitate ascorbic acid and, therefore, could not be used. In referring to the paper by Widenbauer noted above, the authors stated that the indophenol method was entirely satisfactory when reducing substances other than ascorbic acid and pigments were precipitated with mercuric acetate and when the partially oxidized ascorbic acid was reduced with H_2S before titrating with the dye. The time interval must be short, about 5 min., between mercuric acetate treatment and reduction with H_2S, so that all the ascorbic acid is in the reduced form.

The isolation from wheat germ oil of an alcohol, α-tocopherol, having the properties of vitamin E, H. M. EVANS and O. H. and G. A. EMERSON (*Jour. Biol. Chem., 113 (1936), No. 1, pp. 319–332, figs. 2*).—In this study from the University of California, an oily alcohol having the properties of vitamin E was isolated from the nonsaponifiable matter of wheat-germ oil with the use of cyanic acid. The name proposed for the alcohol was α-tocopherol from the roots "tokos=childbirth; phero=to bear; -ol indicating an alcohol." It has a melting point of from 158° to 160° C.; a characteristic absorption band at 2,980 a. u., $E^{1\ \text{percent}}_{1\ \text{cm}} = 90$ *ca;* and an analysis of two derivatives, urethane and allophanate, indicated a provisional formula of $C_{29}H_{50}O_2$. Two other allophanates isomeric with α-tocopherol were also obtained from the wheat-germ oil. One allophanate with a melting point of 250° had no vitamin E potency and the other with a melting point of 138° had some vitamin E potency. Single doses of 1 mg of α-tocopherol produced litters of rats sporadically and 3 mg produced litters quite regularly.

Adaptation of the micro-Kjeldahl method for the determination of nitrogen in plant tissues, N. W. STUART (*Plant Physiol., 11 (1936), No. 1, pp. 173–179*).—In this contribution by the Maryland Experiment Station, the Pregl micro-Kjeldahl method used in organic chemistry laboratories for determination of nitrogen was applied to the determination of total organic nitrogen in plant tissues. Micromethods are proposed for the estimation of nonprotein, basic, and amide nitrogen in plant extracts. It is concluded that micromethods are rapid, economical, and as accurate as macromethods for determinations of total organic nitrogen in plant tissues, and of nonprotein, basic, and amide nitrogen in plant extracts.

Physiological investigations of change in the membrane materials of the higher plants.—I, Descriptions of methods for analyses of the principal membrane substances and a critical study of the method of quantitative comparison [trans. title], T. FUJITA (*Bul. Sci. Fakult. Terkult., Kjûsu Imp. Univ., Fukuoka, Japan, 6 (1935), No. 4, pp. 387–403; Ger. abs., pp. 402, 403*).—Including the Köketsu pulverizing method (E. S. R., 61 p. 627), the author presents and describes procedures for the analysis of such membrane substances as pectin, cellulose, hemicellulose, and lignin, and for comparisons be-

tween old and young leaves or between different plant organs as to their content in these substances.

Chlorophyllometry, L. H. RODDIS (*Plant Physiol., 11 (1936), No. 1, pp. 211, 212*).—This is an application of methods of hemoglobinometry to chlorophyll estimation. Relative chlorophyll determination is made by colorimeter comparisons of fresh alcoholic extractions from the leaf.

The fluorometric estimation of lactoflavin, G. C. SUPPLEE, S. ANSBACHER, G. E. FLANIGAN, and Z. M. HANFORD (*Jour. Dairy Sci., 19 (1936), No. 3, pp. 215–220, pls. 2*).—This contribution describes a simple method for quantitatively estimating the lactoflavin content of solutions based on its fluorescent properties in "black light". This method requires only standard lactoflavin solutions and an ultraviolet light generator with a suitable filter, and was found to be accurate to 0.1γ of lactoflavin, while concentrations as low as 0.05γ per milliliter could be detected. It is applicable not only to solutions of pure lactoflavin but also to concentrates containing relatively large amounts of impurities, provided the impurities do not interfere with the fluorescent color.

Modifications of the bipyridine method for available iron, G. O. KOHLER, C. A. ELVEHJEM, *and* E. B. HART (*Jour. Biol. Chem., 113 (1936), No. 1, pp. 49–53*).—This paper from the Wisconsin Experiment Station presented modifications of the α,α'-bipyridine method of Hill (E. S. R., 64, p. 712) for pigmented plant tissues and for fresh animal tissues.

A plant tissue sample with an approximate iron content of 0.01 mg was treated with acetic acid, α,α'-bipyridine in 10 percent acetic acid and hydroquinone, allowed to stand until maximum color had developed, treated with a lead acetate solution, allowed to stand overnight, then centrifuged, and the color compared with that of the standard. Fresh tissues gave better results than dried samples. For very bulky materials better results were obtained when the reagents were doubled.

For fresh animal tissues samples were treated with trichloroacetic acid, hydroquinone, and α,α'-bipyridine in 10 percent acetic acid, allowed to stand overnight, then treated with alcohol, and continued with the procedure used for the plant tissues.

For fresh tissues the water content was determined and was taken into account in calculating the available iron. Determination of the pH of the tissue is advised to make certain that the range is between 2.5 and 5 before comparing colors. Results are given of the determinations of available iron of 14 food materials, some in duplicate.

Studies on aluminum.—I, A critical study of quantitative colorimetric methods for aluminum on biological material, D. F. EVELETH and V. C. MYERS (*Jour. Biol. Chem., 113 (1936), No. 2, pp. 449–465*).—In this investigation colorimetric methods for the determination of aluminum described by Underhill and Peterman (E. S. R., 62, p. 503) and Myers, Mull, and Morrison (E. S. R., 60, p. 312) were applied to biological tissues to determine their relative accuracy for quantitative aluminum studies. The procedure developed for the preparation of tissues used dry ashing in preference to wet ashing in view of the formation of an insoluble precipitate in the acid which cannot be removed from the Kjeldahl flask. Wet ashing also requires the use of nitric and sulfuric acids, which in quantities used for a 50-g sample of tissue contain demonstrable amounts of aluminum. To remove interfering substances, aluminum and iron were quantitatively precipitated as phosphates to remove other metallic salts and then separated by means of sodium hydroxide, ammonium thiocyanate, or cupferron. The three methods for separating the aluminum were found to be equally satisfactory. The results indicated that aurin, used by

Myers et al., was the most specific and satisfactory reagent for the colorimetric determinations. Aurin, alizarin, and 8-hydroxyquinoline yielded identical results when the tissue digests were free from all known interfering substances. 1,2,5,8-hydroxyanthraquinone was found a sensitive reagent for qualitative determinations for aluminum.

On the detection of added water in milk, B. DAVIES (*Jour. Dairy Res. [London], 6 (1935), No. 1, pp. 56–71, pl. 1, figs. 5*).—The author proposes a formula combining the refractive index, the electrical conductivity, and the rotation of the plane of polarization of milk by which it is possible to determine quantitatively the degree of water adulteration in milk.

The determination of ascorbic acid in urine with phospho-18-tungstic acid, G. MEDES (*Biochem. Jour., 29 (1935), No. 10, pp. 2251–2255, figs. 2*).—A new method for the determination of vitamin C in the urine employed Folin's phospho-18-tungstic acid reagent (E. S. R., 73, p. 149), which produced a blue color with ascorbic acid in about 3 min. at room temperatures of 26°±4° C. The reaction was carried out in acid solution pH 5 to prevent interference of all reducing substances except thiol compounds, and the action of these compounds was prevented by the addition of formaldehyde. The urine was titrated against 1, 2, and 4 cc of standard 0.001 M ascorbic acid solution. The calculation was made by the formula $0.001 \times \frac{N}{n} \times \frac{20}{R} \times 0.1 = g$ mols ascorbic acid per 100 cc of urine, where N represented the cubic centimeters of the standard, n the cubic centimeters of urine, and R the reading of the colorimeter with standard set at 20.

A method for the preservation of urine for several hours is described. Freshly voided urine is acidified with acetic acid and saturated with hydrogen sulfide. When ready for the ascorbic acid determination, carbon dioxide or nitrogen is bubbled through to remove the sulfide.

Observations on methods for determining vitamin C in the urine [trans. title], R. AMMON and K. HINSBERG (*Klin. Wchnschr., 15 (1936), No. 3, pp. 85–88*).—This study analyzed three titration methods for determining ascorbic acid in the urine for their respective accuracies in giving exact quantitative values. The iodine titration method yielded high values due to the presence of reducing substances, cysteine and glutathiones, which reduced iodine solutions in acid medium. The use of potassium iodide to prevent the reduction of the iodine solution by cysteine lowered the iodine value but left other interfering substances in the urine, and there was some question whether cysteine completely lost its reducing property by this procedure. The difficulty with the 2,6-dichlorophenolindophenol titration method (Tillmans'), was interference due to natural pigments in the urine, an indefinite end point with certain solutions, the presence of other reducing substances, and the fact that the unknown solution was not titrated against a known solution. These factors tended to yield values too high.

The methylene blue method of Martini and Bonsignore (E. S. R., 73, p. 746) compared the unknown solution with a control solution of known quantities of methylene blue. Reducing substances such as cysteine and glutathione did not interfere with this method. When it was applied to urines, the control solution was pigmented with a weak solution of bromothymol blue to the same degree as the urine. This method has certain difficulties such as an indistinct end point in very dark colored urines and the production of reducing substances through a long exposure to the 500–1,000 w lamp used for this method. Determinations of milligrams percent of ascorbic acid in the urine by the iodine, potassium iodide-iodine, and indophenol methods yielded values considerably higher than the methylene blue method. The preparation Detoxin, containing no

appreciable amounts of vitamin C. gave a value of 16.95 mg percent with iodine, 10.90 with potassium iodide-iodine, 9.52 with indophenol, and 0.16 with the methylene blue method. For 100 g placenta the values averaged 25.2 mg percent of ascorbic acid for the iodine method, 14.11 for the potassium iodide-iodine, 8.84 for the indophenol, and 1.30 for the methylene blue.

The modification of the indophenol method described by Emmerie and Van Eekelen (E. S. R., 73, p. 583) and the method of Tauber and Kleiner (E. S. R., 73, p. 885) were discussed briefly for their accuracy. It was noted that ascorbic acid in the urine is unstable and that, therefore, determinations by all the methods should be made on freshly excreted urine. Of the three methods, only the methylene blue method was considered to yield values approximating that of true ascorbic acid content in urine and placenta, but it also was not considered specific and quantitative.

A method to determine small amounts of citric acid in biological material, G. W. PUCHER, C. C. SHERMAN, and H. B. VICKERY (*Jour. Biol. Chem., 113 (1936), No. 1, pp. 235–245*).—In this contribution from the Connecticut [New Haven] Experiment Station, a method is described for determining from 0.1 to 1 mg of citric acid with an accuracy of ±5 percent. The procedure consists of oxidizing citric acid by potassium permanganate in the presence of bromine to form pentabromoacetone. This substance is extracted with petroleum ether, treated with aqueous sodium sulfide, and stabilized with the addition of pyridine. By means of a Pulfrich spectrophotometer the intensity of the color of the solution is determined, and the quantity of citric acid originally present is estimated from the calibration curve of the instrument.

Application of this method was made on blood, urine, feces, and animal and plant tissues for their respective citric acid content.

Studies on the utilization of soybeans (*Indiana Sta. Rpt. 1935, pp. 55, 56*).—Data are given as to the conformity of iodine and potassium iodide solutions used for color evaluations of soybean oil with Beer's law and methods for the removal of phosphatides from crude soybean oil.

Manufacture of table sirups from sugarcane (*Puerto Rico Sta. Rpt. 1935, p. 26*).—Data are reported as to the desirability of blending several varieties for superior flavor and on the prevention of crystallization by the addition of invertase.

Production of sauer rüben, H. E. GORESLINE and L. H. JAMES (*U. S. Dept. Agr. Circ. 389 (1936), pp. 10, figs. 4*).—Sauer rüben was made from 17 varieties of turnips and 6 other kinds of root vegetables. The Purple Top Strap Leaf turnip produced a product graded as excellent. Six other varieties were graded as good.

A good product was made from both spring and fall turnips, although better results were usually obtained from the fall crop. Turnips ranging from 2.5 to 3.5 in. in diameter produced a sauer rüben of flavor and texture superior to that from turnips smaller or larger in size. Turnips with a total sugar content of from 3.25 to 5.31 percent produced good sauer rüben, although the higher sugar content was more desirable as it produced a higher acidity. Peeling the turnips removed some of the sugar and resulted in a product which had a very mild flavor but low acidity and inferior keeping quality. Shredded turnips produced a sauer rüben of superior quality, the texture of which resembled that of sauerkraut more closely than did that yielded by either ground or sliced turnips. A more tasty sauer rüben was obtained when 2.2 percent of salt was used than with the 2.5 percent of salt ordinarily used in making sauerkraut.

"Sauer rüben can be fermented and kept a long time by packing in such a way as to exclude air from the product. Closed glass containers were more

effective in this than either open jars covered with mineral oil or jars left exposed to the air. Sauer rüben can be fermented in closed jars and stored for considerable periods at temperatures ranging from 42° to 80° F. without sterilizing. Exposure of sauer rüben to the air resulted in a darkening of the product and eventual spoilage. Sauer rüben can be canned in tins by using a 2.5-min. exhaust and a 7-min. cook in flowing steam. This method gives a tender product and insures preservation of the material."

AGRICULTURAL METEOROLOGY

Climatic features in relation to agriculture (*Puerto Rico Sta. Rpt. 1935, pp. 4–12, figs. 5*).—Climatic features of Puerto Rico are shown to be an important agricultural asset because of 12 mo. of temperature favorable to plant growth, freedom from frost, and abundant rainfall, and for other reasons, affording opportunity for growth of winter crops and for year-round experimental work. It is necessary, however, to safeguard against hurricane damage by selecting crops less subject to such damage and against soil erosion due to heavy and sometimes torrential rainfall. Amount and distribution of rainfall in the island are shown graphically in a series of charts.

The influence of the sun on human affairs, H. T. Stetson (*Sci. Mo., 43 (1936), No. 1, pp. 14–22*).—From his study the author concludes among other things that "the effect of sunspots on biological behavior appears to have been established beyond contention through the growth of trees whose ring patterns have been definitely shown by Douglass (E. S. R., 60, p. 417) to show the sunspot cycle through the centuries. . . . The question of the effect of the solar cycle on the weather is highly complex, but sufficient evidence seems to have been presented to give a basis for believing that storminess on the earth migrates through definite cycles, which follow in general the cycle of solar activity."

The influence of solar variability on weather, C. G. Abbot (*Sci. Mo., 43 (1936), No. 2, pp. 108–121, figs. 14*).—The author presents evidence from variation in solar radiation which convinces him that such variation is an important weather factor hitherto generally unrecognized.

Method of forecasting rainfall in behalf of the time of sowing tobacco [trans. title], C. Coolhaas (*Proefsta. Vorstenland. Tabak [Dutch East Indies], Meded. 83 (1936), pp. [1]+17; Eng. abs., pp. 16, 17*).—The author proposes an improvement of the Tollenaar method (E. S. R., 64, p. 14), based on air pressure, for forecasting rainfall in relation to tobacco planting in Java, and reports results of tests of the method for which a considerable degree of accuracy is claimed.

SOILS—FERTILIZERS

The Third International Congress of Soil Science, F. E. Hance (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 40 (1936), No. 2. pp. 127–136*).—"This paper is essentially a résumé of notes made by the author while in attendance at the sessions of the Third International Congress of Soil Science in England. Topics discussed are: Soil survey; soil reaction; acid-forming nitrogenous fertilizer; the functions of calcium in (1) base replacement, (2) correction of soil acidity, (3) amelioration of soil colloids, and (4) in the conservation of applied potash; manganese; and estimations of active chemical factors in plant nutrition."

[Soil and fertilizer studies by the Indiana Station] (*Indiana Sta. Rpt. 1935, pp. 14, 15, 56, 57, fig. 1*).—Data are given as to the results of fertilizer trials on the Purdue-Vincennes Farm, the improvement of southeastern In-

diana upland flats, the fertilization of muck soils, a study of the Pierre method for the determination of equivalent acidity and basicity of fertilizers, the use of the Neubauer method in determining fertilizer requirements of soils, and determination of the available potash in mixed fertilizers.

[Soils and crops work by the Indiana Station: Moses Fell Annex Farm], A. T. WIANCKO and G. P. WALKER (*Indiana Sta. Circ. 219 (1936), pp. 6–10*).—This circular contains, for the 1934 season, the usual annual report (E. S. R., 72, p. 13) on the general fertility test and the comparison of various phosphates.

[Soil and fertilizer studies by the Rhode Island Station] (*Rhode Island Sta. Rpt. [1935], pp. 23, 26*).—Data are reported on the effect of crops on soil acidity and on the basicity of dolomite and colloidal, rock, and calcined phosphates.

[Soil and fertilizer studies of the Tennessee Station], W. H. MACINTIRE (*Tennessee Sta. Rpt. 1934, pp. 16–19*).—Results are briefly noted from a laboratory study of the liming of soils, the absorption of calcium and magnesium by soils, the direct solubility of calcic and magnesic materials in rainwater, lysimeter experiments, lime-potash absorption studies, the influence of limestone and dolomite on superphosphate, sulfate conservation, the utilization of nitrogenous materials, and the production and properties of dicalcium phosphate.

[Soil Survey Reports, 1930 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1930, Nos. 40, pp. 55, pls. 2, figs. 2, map 1; 41, pp. 35, figs. 2, map 1*).—These reports were prepared with the cooperation of the Ohio Experiment Station.

No. 40. *Soil Survey of Brown County, Ohio*, E. D. Fowler and T. C. Green.—Brown County, in southwestern Ohio, has an area of 316,800 acres. Its land surface is that of a broad undulating plain, dissected by the Ohio River and its tributaries. The 22 soil series represented are subdivided into 26 types and numerous phases. Rossmoyne silt loam, which covers 21.5 percent of the area surveyed, Clermont silt loam, of which 18.7 percent was found, and Avonburg silt loam, which amounts to 16.8 percent, are the most extensive types listed. A section on the management of the soils of the county, by J. A. Slipher et al., is included.

No. 41. *Soil survey of Putnam County, Ohio*, A. E. Taylor et al.—Putnam County, in the northwestern part of Ohio, has a land area of 308,480 acres and lies largely in a level plain described as part of an old glacial lake basin. Most of the drainage waters empty into Lake Erie.

The soils form 19 series, inclusive of 34 types, the more extensive of these soils being Pandora silty clay, covering 12 percent of the area of the county, Brookston clay, forming 11.9 percent, and Paulding silty clay, amounting to 11.8 percent.

[Soil Survey Reports, 1931 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1931, Nos. 16, pp. 36, pls. 2, figs. 4, map 1; 18, pp. 36, pls. 3, figs. 2, map 1; 19, pp. 60, pls. 3, figs. 3, map 1; 21, pp. 24, figs. 2, map 1*).—The surveys here noted were made with the cooperation, respectively, of the Montana, Indiana, and Arizona Experiment Stations, and the North Carolina Department of Agriculture and Station.

No. 16. *Soil survey of the Gallatin Valley area, Montana*, W. DeYoung and L. H. Smith.—The Gallatin Valley area covers 513,280 acres, about 30 percent of the land included within the boundaries of Gallatin County, southwestern Montana, and the greater part of the farming land. The area occupies a basin partly enclosed by high mountains and is "one of the most important agricultural areas of the northern Rocky Mountain States." Irrigation water is provided by the Gallatin River and its larger tributaries.

The soils of the area were found to form 12 series containing 22 types and several variant phases of some of these types. Manhattan very fine sandy loam, which occupies 12.5 percent of the area, is the most extensive type listed. Rough broken and mountainous lands were found to the extent of 25.3 percent.

No. 18. *Soil survey of Randolph County, Indiana*, W. H. Buckhannan et al.—Randolph County, lying in the central position against the eastern boundary of Indiana, occupies 286,080 acres of the nearly level lands in the late Wisconsin glacial drift region. The soils consist of 14 series and include 16 types. Brookston silty clay loam occupies 26.1 percent of the area examined, Crosby silt loam 25.7 percent, Crosby silty clay loam 19.9 percent, and Miami silt loam 11.5 percent. A section of the report by A. T. Wiancko and S. D. Conner deals with the management of the soils of the county.

No. 19. *Soil survey of the Tucson area, Arizona*, F. O. Youngs et al.—The Tucson area, southeastern Arizona, occupies 276,480 acres and consists largely of stream valleys with narrow strips bordering them. Irrigation is necessary, and "the present trend in cultivated acreage is downward."

Soils of 16 series and 45 types were found, the most extensive type being Tucson loam, which covers 8.9 percent of the area included in the survey.

No. 21. *Soil survey of Franklin County, North Carolina*, W. A. Davis et al.—Franklin County is an area of 314,880 acres in north-central North Carolina. It varies in surface relief from nearly level to strongly rolling and depends mainly on the Tar River for its drainage.

The soils consist of Appling coarse sandy loam to the extent of 29.4 percent, with Cecil sandy loam 11.5 percent, Cecil coarse sandy loam 10.9 percent, Appling sandy loam 10.1 percent, and others of minor importance, making a total of 9 series, including 13 types. Unclassified lands include meadow 3.8 percent.

[Soil Survey Reports, 1932 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1932, Nos. 6, pp. 39, pls. 2, figs. 2, map 1; 7, pp. 40, pls. 2, figs. 2, map 1; 8, pp. 25, pls. 2, figs. 2, map 1; 9, pp. 38, figs. 3, map 1*).—The four reports here noted cover surveys carried out with the cooperation, respectively, of the Virginia and Texas Experiment Stations, the North Carolina Department of Agriculture and Station, and the Texas Station.

No. 6. *Soil survey of Nansemond County, Virginia*, R. E. Devereux et al.—Nansemond County has an area of 270,720 acres in southeastern Virginia, flat to rolling in surface relief, and dependent for drainage upon the Nansemond and Blackwater Rivers.

Of the total area, 23.5 percent consists of swamp, peat, and tidal marsh, and a group of light-colored poorly drained soils embraces 20.9 percent of the county. Norfolk fine sandy loam, the most important cultivated soil, occupies 26.5 percent. In all, 7 series, including 18 types, were found.

No. 7. *Soil survey of Falls County, Texas*, M. W. Beck.—This area of 484,480 acres in east-central Texas has, in general, an undulating to rolling surface, but includes also some large bodies of flatlands. All drainage is to the Brazos River.

The soils listed in the report here noted were found to form 21 series of 27 types, the most extensive being Houston black clay, 17.6 percent, and Wilson clay loam, 10 percent.

No. 8. *Soil survey of Washington County, North Carolina*, W. A. Davis and K. V. Goodman.—Washington County, in northeastern North Carolina, consists of 221,440 acres of flat or nearly level lands, of which 54.1 percent are muck, peat, and swamp. Only a small part of the county has good natural drainage. Of classifiable soils, 7 series were found to include 12 types, of which Bladen loam, 9.5 percent, is the most extensive.

No. 9. *Soil survey of Hardeman County, Texas*, E. H. Templin and T. W. Glassey.—Hardeman County, northern Texas, covers 443,520 acres of the Rolling Plains region. Tillman clay loam, 11.5 percent, is the most extensive soil among 13 series of 27 types. Rough broken land is listed as covering 12.8 percent of the county, and it is stated that about one-fourth of the county is too rough for agricultural use.

Genesis and composition of peat deposits, B. D. WILSON, A. J. EAMES, and E. V. STAKER ([*New York*] *Cornell Sta. Mem. 188 (1936), pp. 13, fig. 1*).—Typical peat deposits of the intensively cultivated areas of New York were examined to ascertain their mode of formation and the effect of the underlying material on the botanical and chemical composition of the plant remains of the profile layers. Three of the profiles described are those of deposits having a surface layer of woody peat. Two are of immature deposits, one having a surface layer of fibrous peat, the other a surface layer of moss peat. Of the five deposits, three are underlain with calcareous material.

The nature of the material underlying a deposit is shown to affect the calcium content and the reaction of the profile layers. This relationship was more readily discernible, under the conditions of the investigation, than was the effect of the character of the underlying material on the botanical composition of the layers. Under conditions of comparative dryness, the presence of *Sphagnum* appears to be indicative of a deposit underlain with material of acid reaction.

Capillary conductivity measurements in peat soils, L. A. RICHARDS and B. D. WILSON (*Jour. Amer. Soc. Agron., 28 (1936), No. 6, pp. 427–431, figs. 2*).—In a contribution from the [New York] Cornell Experiment Station an apparatus of improved design, which was used in measuring the capillary conductivity of water in peat soils, is described.

At low tensions the soils were found to possess capillary conductivities greater than those that have been reported for mineral soils. However, the capillary conductivity was found to become zero at lower tensions in the two peat soils studied than has been reported for mineral soils.

Difficulty was experienced in measuring the capillary conductivity of peat soils because of the length of time required for the moisture content of the soils to reach an equilibrium value at a given capillary tension.

Land relief, F. J. MARSCHNER (*U. S. Dept. Agr., Atlas Amer. Agr., 1936, pp. 6, figs. 4*).—This brief article summarizes the influence of land relief on the agricultural value and utilization of soils under the heads of major physiographic features, influences of land relief on climate, influence of land relief on soils, and direct influence of relief on land use. A large map showing the physical features of the United States is included.

The residual effect of fertilizers, R. L. COOK and C. E. MILLAR (*Michigan Sta. Quart. Bul., 18 (1936), No. 4, pp. 227–234*).—From experiments continued for several years on various soil types in eastern Michigan, it is concluded, in part, that the effective period of a fertilizer application may range from 1 to 4 yr. This range is dependent, apparently, upon such factors as soil, weather, cultural methods, kind of crop, and quantity of fertilizer applied. Larger residual benefits have been obtained during a year immediately following one of low rainfall. The increased yields of oats and barley resulting from residual fertilizer have, in most cases, been great enough to pay for a considerable portion of the fertilizer applied for the preceding crop, and, in many cases, more than enough to pay the entire fertilizer bill. When small grain nurse crops have been liberally fertilized the residual fertilizer has been sufficient for the needs of the alfalfa during two harvest years, the increases in yield of alfalfa, in most cases, paying for all the fertilizer applied for the nurse crop. From 200- to 300-lb. applications of fertilizer on old stands of

alfalfa caused increased yields for at least 3 yr., although the increases during the third year were rather small.

Some effects of long-continued manure, fertilizer, and lime treatment on the composition of cropped soils, A. W. BLAIR and A. L. PRINCE (*New Jersey Stas. Bul. 604 (1936), pp. 24, figs. 18*).—Cylinder and field plat soils cultivated and cropped for from 25 to 35 yr., farm soils cultivated and given rather heavy fertilizer treatment for some years, and corresponding soils neither cultivated nor treated with fertilizers were comparatively examined, with results in part as follows:

"Continuous cropping even under good management and fertilizer treatment tends toward a depletion of the organic matter of the soil thus treated in comparison with the soil as it was when the experiment was started. This is shown in a slight lowering of the percentage of nitrogen, carbon, and loss on ignition. Where no fertilizer, manure, lime, or green manure has been used on field plats for 25 yr., the soil has become so depleted in fertility that it does not yield a crop big enough to be harvested. However, with heavy applications of farm manure—heavier than would be economical in general farming—the content of organic matter is gradually increased over a period of years. This is shown by an increase in the percentage of nitrogen, carbon, and loss on ignition. . . . A depletion of the organic matter is also noted generally when soils that are continuously cropped and fertilized are compared with corresponding soils not fertilized and cropped."

The phosphorus content was in general gradually increased under cultivation and fertilizer treatment.

The potassium content was somewhat affected by liming, but little increase in potassium content was effected by the prolonged application of fertilizers containing this element.

"It is evident that potato soils in the sections examined are, in the majority of cases, being enriched in total phosphorus, are not changed very much in total potassium, and are gradually losing in content of organic matter."

The effect of fertilizers and cropping upon the nature and amount of electrodialyzable bases in the soil, with particular reference to potassium, G. M. GILLIGAN (*Delaware Sta. Bul. 200 (1936), pp. 14*).—Plat soils continuously cropped and subjected to definite fertilizer treatments and liming during a period of 24 yr. were electrodialyzed in order to determine the influence of cropping and treatments upon the quantities of the bases removed by this method.

Both dialyzable and total calcium and magnesium were increased by applications of lime. Calcium constituted the greater part of the bases removed.

Applications of lime increased the dialyzable potassium and manganese. The total potassium content of the limed plats exceeded that of the unlimed. The effects of liming upon exchangeable potassium (as determined by neutral ammonium acetate) were similar "save in two cases in which the values for limed and unlimed soils were identical." The values for exchangeable potassium were somewhat lower than those for electrodialyzable potassium. "Applications of potash fertilizers were reflected in the amounts dialyzable and exchangeable. The plat receiving manure only contained the greatest amount of dialyzable potassium." "Definite conclusions as to the effect of liming upon the availability of potassium cannot be arrived at, since data relative to the actual amounts of this element withdrawn by the crops are not available. While liming appears to have been generally beneficial to the particular plats investigated, since both the replaceable and total potash of the limed plats exceed that of the unlimed and the yields increased, the actual differences are small. Furthermore, when the yields from all blocks were taken into consideration, it

was concluded that the addition of lime was significantly profitable only when used in conjunction with potassium."

"Additions of superphosphate were readily reflected in the amounts of phosphorus dialyzed. Liming increased the amounts dialyzable and with few exceptions decreased the total phosphorus as compared with the unlimed plats. There are indications that liming increases the availability of phosphorus."

"A decrease in losses by leaching from the limed soils is suggested in explanation of the results obtained for the particular plat soils investigated. No consistent relationship appears to exist between the colloidal content and amount of electrodialyzable bases. The amounts of bases removed by electrodialysis do not, in themselves, appear to furnish a sufficiently accurate index to the ability of the soil to supply nutrients to the plant."

Soil changes resulting from nitrogenous fertilization: A lysimeter study, M. F. MORGAN (*Connecticut [New Haven] Sta. Bul. 384 (1936), pp. 367–449, figs. 8*).—This bulletin reports upon a detailed and thorough investigation of the effects of sodium nitrate, ammonium sulfate, urea, and cottonseed meal upon the drainage loss from the surface 7 in. of four soils having various textures and the following base exchange capacities and percentages of saturation with bases: Enfield very fine sandy loam—base exchange capacity 6.91 milliequivalents per 100 g of soil and 21.6 percent base saturated; Merrimac loamy sand—base exchange capacity 3.24 m. e. per 100 g of soil and 29 percent base saturated; Wethersfield loam—base exchange capacity 7.95 m. e. per 100 g of soil and 55.6 percent base saturated; and Merrimac sandy loam—base exchange capacity 5.13 m. e. per 100 g of soil and 38 6 percent base saturated.

The soils were held in exterior lysimeters under natural climatic conditions for 5 yr. The tanks were cylindrical, 20 in. in diameter, and contained a layer of 7 in. of surface soil over a conical drainage bed of coarse quartz sand. Drainage water was collected after each period of leaching, and composites were analyzed at semiannual periods.

The treatments supplied 200 lb. of nitrogen and other materials furnishing a total of 100 lb. of phosphoric acid (P_2O_5) and 200 lb. of potash (K_2O) per acre per year. The fertilizer was applied on May 26 of each year. The soils in the surface soil tanks were kept fallow. At the same time a separate series of tanks of the Merrimac sandy loam soil 20 in. in depth received the same treatments and was cropped to tobacco each year.

"The four soils have shown marked variations in amounts of dainage water, especially during the summer-fall period. The Merrimac loamy sand was the most leachy in performance. The Merrimac sandy loam soil retained practically the same proportion of the rainfall as the much heavier Wethersfield loam. The Enfield very fine sandy loam was definitely more resistant to leaching than the other three soils. For the 5 yr. the summer-fall leachings were 30.5 percent of the rainfall, while those from the winter-spring period were 51.2 percent of precipitation as an average of the four soils. These results were obtained with an average annual rainfall of 35.96 in., which was 8.11 in. below the 62-yr. average."

"A comparative summation of determined basic and acidic constituents showed an excess of anions on all soils and treatments except the nitrate of soda and urea treatments on the Wethersfield loam soil. This trend has been consistent in practically every period of analysis. The excess of acidic constituents over determined bases has been highest on sulfate of ammonia tanks and has also shown a correlation in magnitude with the initial degrees of base-unsaturation of the various soils. The source of this discrepancy is not definitely established. It may be due in part to iron for the sulfate of am-

monia treatments, but this explanation is inconsistent with the uniformly smaller predominance of anions for urea as compared with cottonseed meal."

A study of the availability of ammoniated superphosphate and various unusual phosphatic carriers by means of vegetative pot tests, B. E. GILBERT and F. R. PEMBER (*Rhode Island Sta. Bul. 256 (1936), pp. 24*).—"The relative availability of a number of unusual phosphate carriers was estimated by means of the dry weight yields of barley, oats, clover, and millet grown in soil in Wagner pots. The majority of the chemicals were supplied by the Bureau of Chemistry and Soils of the U. S. Department of Agriculture, and cooperation was maintained with this Bureau throughout the entire period of the tests."

When compared with monocalcium phosphate as 100, precipitated dicalcium phosphate gave a relative yield of 95, treble superphosphates prepared from ground dolomite and phosphoric acid or from ground limestone and phosphoric acid 91, 88, and 88, calcined phosphate 82, dimagnesium phosphate 79, calcium pyrophosphate 67, and ammoniated superphosphates prepared from various sources 61 percent.

Tricalcium phosphate, steamed bonemeal, and magnesium ammonium phosphate showed availabilities of 45, 45, and 41 percent, and "should be considered as having fertilizer possibilities". Aluminum phosphate (unignited) showed 36, boneblack 29, aluminum phosphate (ignited) 27, Ruhm phosphate 25, and ferric phosphate (ignited) 18 percent.

The results of determinations of phosphoric acid removed by the growth of the crop and of determinations of the theoretical availability of the carriers agreed well with the availability as indicated by crop growth.

Movement of lime in soils as determined by soil reaction, A. G. WEIDEMANN (*Michigan Sta. Quart. Bul., 18 (1936), No. 4, pp. 254–259*).—Colorimetric acidity tests were made in various parts of the plowed layer of several soils that had been limed in different ways with varying quantities of several liming materials, and H-ion (pH) determinations were made electrometrically on a large number of samples taken at different depths from Hillsdale sandy loam soil that had been plowed once 2 yr. after liming and sampled 2 yr. after plowing. Similar determinations were made on Coloma sand sampled about a year after marl had been applied but not worked in.

"The data substantiate previous observations to the effect that there is a great tendency for lime to remain in that portion of the soil in which it is placed until mixed through the soil by tillage operations. So great is this tendency that 4 yr. after liming, and 2 yr. after plowing, highly alkaline soil areas were found very near soil testing 1.5 pH units lower. Marl which had been on the surface of a sandy soil for more than a year had neutralized the soil to a depth of not more than 2 in., although it had slightly affected the pH values of this soil to a depth of 6 or 8 in. These results illustrate the disadvantage of applying lime to the soil surface when the crop is growing or when for other reasons the lime cannot be worked into the soil.

"It is evident from the findings herein reported that a serious error may readily be made, through faulty sampling, in determining the lime requirements of a soil which has been limed previously."

Preliminary note on the inventory and balance sheet of plant nutrients in the United States, J. G. LIPMAN and A. B. CONYBEARE (*New Jersey Stas. Bul. 607 (1936), pp. 23*).—From a study of available data on soil gains in nitrogen, phosphorus, potassium, calcium, magnesium, and sulfur contents due to fertilizers and liming materials, manures and bedding, rainfall, irrigation waters, seeds, and nitrogen fixed and on losses brought about by harvested crops, grazing, erosion, and leaching, the authors arrived at figures showing an enormous annual net loss of plant nutrients from our soils. In addition to

heavy losses of potassium, calcium, and magnesium, they believe the net phosphorus loss per year to be "almost 10 times as much as is supplied by chemical fertilizers", and they find the nitrogen loss to be probably "more than 30 times the amount of nitrogen supplied by chemical fertilizers."

The depletions of soil plant food content discussed in the present bulletin "are of such a character as to call for the prompt adoption of measures which would offer to us assurance of more or less effective conservation and of a lessening drain on our resources of plant nutrients. Changed methods of soil management which would include proper provision for lessening the losses due to erosion and leaching would represent a major conservation measure. Such changes in our soil and crop management systems as would permit a lessening in the run-off, an increase in the amount of water stored in the soil, an increase in the area occupied by legumes, an increase in nonsymbiotic nitrogen fixation, and a decrease in the excessive oxidation of organic matter would almost, if not quite, permit the elimination of the annual deficit in respect to our soil nitrogen resources."

Synthetic manure production in Michigan, L. M. Turk (*Michigan Sta. Circ. 157 (1936), pp. 11, fig. 1*).—The author finds that the annual rainfall in Michigan is sufficient to produce a good grade of synthetic manure within a period of from 8 to 10 mo. during a normal season. If water is added to the compost, it will hasten the rotting process, however; and in this manner manure may be produced within 4 or 5 mo. Temperature did not appear to be a limiting factor in the production of synthetic manure except in months when the composts may be frozen over half way down from the top. During these winter months decomposition was found to be very slow.

"One ton of dry straw will produce about 2½ tons of wet manure. The total cost of the fertilizer ingredients is approximately 70 ct. per ton of wet manure, or $1.75 for the total cost of the chemicals to treat the original ton of dry straw. If straw is used in making synthetic manure, it will be more desirable to apply the chemicals at threshing time. This makes unnecessary the rehandling of the straw. The synthetic manure is equal or superior to barnyard manure in increasing crop yields."

AGRICULTURAL BOTANY

International rules of botanical nomenclature (*Jena: Gustav Fischer, 1935, 3. ed., pp. XI+152*).—International rules of botanical nomenclature were adopted by the International Botanical Congresses of Vienna, 1905, and Brussels, 1910, revised by the International Botanical Congress of Cambridge, 1930, and compiled by the editorial committee for nomenclature from the report of the subsection of nomenclature prepared by J. Briquet. The English version is by A. B. Rendle, the French by B. P. G. Hochreutiner, and the German by H. Harms. Supplements are provided on "nomina generica conservanda proposita", and on "species lectotypicae propositae", the specific parts of which are by various authors. There is also a brief summary of the more important changes in the rules from the second edition, by H. Harms, and an analytical index.

A new rapid method for the determination of living, killed, and injured tissues of green plants [trans. title], F. F. Mazkov (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 1 (1936), No. 6, pp. 265, 266*).—Proceeding from observations on the browning of dead leaves with acid sap—a generally known fact explained by loss of protoplasmic impermeability after death—the author submerged the chlorophyll-bearing tissue to be tested in a weak (from 0.1 to 0.3 N) hydrochloric acid solution. After from 15 to 20 min., the dead tissue

could be distinguished infallibly from the living by the browning of the former. Injured, but not entirely killed, tissues exhibited scattered brown flecks. The method proved both rapid and successful.

The nuclear crushing method [trans. title], E. HEITZ (*Ber. Deut. Bot. Gessell., 53 (1935), No. 10, pp. 870–878, pl. 1, fig. 1*).—Methods of cytological study without recourse to the microtome are reviewed, and a rapid method involving the crushing of plant tissues, successfully used by the author, is described.

Simple apparatus for the quantitative determination of photosynthetic and respiratory ratios, B. S. MEYER and D. S. RADER (*Plant Physiol., 11 (1936), No. 2, pp. 437–448, fig. 1*).—The apparatus described in this contribution by Ohio State University depends, in principle, on the measurement of changes in volume of the CO_2 gas present in the apparatus by absorption in a KOH solution and on the measurement of changes in a volume of the oxygen gas present by manometric means. Results of sufficient quantitative exactness to demonstrate clearly the important principles regarding photosynthetic and respiratory ratios are easily obtained, and representative determinations made with this equipment are tabulated.

The preparation of "three-colour" strips for transpiration measurements, F. Y. HENDERSON (*Ann. Bot. [London], 50 (1936), No. 198, pp. 321–324, fig. 1*).—Directions are given for the preparation and use of a modification of the Livingston and Shreve technic (E. S. R., 37, p. 26) for the application of cobalt chloride paper to transpiration measurements.

Micro-scale for a microscopic determination of pH, Z. E. BEKKER (*Bot. Zhur. S. S. S. R. (Jour. Bot. U. R. S. S.), 20 (1935), No. 4, pp. 348–352, fig. 1; Eng. abs., p. 352*).—"This scale is glued upon a cover glass fixed in a metallic ring and can be easily introduced into the ocular of any kind of microscope like an ocular micrometer."

Rice bran extracts and the growth of microorganisms, R. W. DUNN and A. J. SALLE (*Jour. Bact., 31 (1936), No. 5, pp. 505–516*).—In this study from the University of California rice bran was found to contain a stimulating substance or substances for carbohydrate-fermenting bacteria and for yeasts. Old extracts showed less stimulating ability for both bacteria and yeasts, while fresh extracts prepared from fresh or old bran were equally effective on bacteria but only those from fresh bran gave good yeast stimulation.

With the possible exception of phosphate, these extracts contained all substances necessary for the growth of *Escherichia coli* and many other organisms. Better growth of most organisms was obtained with buffered extract medium than with ordinary bacteriological infusion medium. The use of 0.1 percent peptone rice bran extract medium is recommended for obtaining better growth and increasing the growth rate of carbohydrate-fermenting bacteria.

Control of sexual reproduction in Phytophthora cactorum, L. H. LEONIAN (*Amer. Jour. Bot., 23 (1936), No. 3, pp. 188–190*).—*P. cactorum* grew in a synthetic medium consisting of the essential salts plus a pure grade of dextrose only on addition of proteose peptone or certain other organic substances. Not all growth-promoting substances proved capable of inducing sexual reproduction, but when exposed to a few cubic centimeters of pea infusion for as little as 1 hr. the fungus developed both oogonia and antheridia. On the other hand, certain substances, e. g., even such good growth-promoting substances as peptone, inhibited sexuality. The carry-over effect of the growth- and sexuality-promoting substances proved to be considerable.

The results of this study appear to indicate that this fungus is unable to synthesize growth- and sexuality-promoting substances.

Flattened chlorophyll disks as structural assimilation units of chloroplasts.—Preliminary contribution [trans. title], E. HEITZ (*Ber. Deut. Bot. Gesell., 54 (1936), No. 5, pp. 362–368, pl. 1*).—From a review of the literature, together with the results of the preliminary cytological study here reported, it is concluded that certain disks observed within the chloroplasts are in reality chlorophyll platelets.

The role of light in the life of plants.—II, The influence of light upon growth and differentiation, P. R. BURKHOLDER (*Bot. Rev., 2 (1936), No. 3, pp. 97–172, figs. 4*).—In this monographic review, under "growth" the author discusses light and darkness, cell multiplication and enlargement, the action of growth substance, and growth of the plant as a whole in relation to light intensity, duration, and quality. Under "differentiation", the discussion includes the plant axis, growth regions, tissue differentiation, leaves, reproduc tion, sex reversal and rejuvenation, and differentiation of the plant as a whole. A literature list of 600 titles is included.

Effect of light intensity on the manganese content of plants, M. M. MCCOOL (*Contrib. Boyce Thompson Inst., 7 (1935), No. 4, pp. 427–437, figs. 2*).—In experiments with soybean and buckwheat outside and with soybean, snap bean, and tobacco in a greenhouse, the visible injury (foliar brown spots and chlorosis) to the plants grown in manganese-treated soil decreased as the light intensity lessened. Except for tobacco, the decrease in yields induced by the manganese sulfate was not prevented by shading.

The percentage of manganese in the leaves of soybean and buckwheat plants from the outside experiment decreased consistently with the lessening of light intensity. In the greenhouse test the manganese content of soybean leaves decreased with increase in degree of shading, as did that of equal areas of the first leaves to develop, but the effect of shading on the amount in equal areas of the second and third leaves was less marked. The content in equal areas of snap bean and tobacco leaves decreased with lessening intensity of light. The percentage of manganese in the stems of plants grown in soil treated with 400 p. p. m. of manganese sulfate varied only slightly, but it increased with the degree of shading in those grown in soil receiving 600 p. p. m. The manganese content of the roots of snap beans and tobacco was remarkably high, although shading decreased it in the tobacco.

Response of certain plants to length of day and temperature under controlled conditions, R. A. STEINBERG and W. W. GARNER (*Jour. Agr. Res. [U. S.], 52 (1936), No. 12, pp. 943–960, figs. 3*).—The responses to day length and temperature of the Biloxi, Peking, and Mandarin varieties of soybeans and of sugar beets and *Rudbeckia bicolor* were studied in an accurately controlled environment with tungsten filament lamps as the light source. The equipment gave readily reproducible results agreeing closely with those obtained in a more natural environment. Within suitable limits, increase in temperature somewhat decreased the range of critical day lengths and slightly increased the range of optimum day length in soybeans, while in sugar beets increased day lengths markedly compensated for unfavorable high temperatures, and the converse was true to a considerable extent. Biennial behavior in the sugar beet is not inherent but results primarily from conditions of day length and temperature unfavorable to reproduction. Though beets require a lower temperature range for flowering than the other long-day type, *Rudbeckia*, the two otherwise behave quite similarly in that within favorable ranges an increase in temperature accelerates reproduction. The temperature responses of the three varieties of soybeans were relatively uniform and but slightly correlated with their behavior as late, medium, and early forms, whereas the marked differences in critical day lengths for flowering agreed

closely with their behavior in nature. The quantitative data on flowering and growth at the several temperature levels and day lengths are given in detail.

Influence of length of day (photoperiod) on development of the soybean plant, var. Biloxi, A. E. MURNEEK and E. T. GOMEZ (*Missouri Sta. Res. Bul. 242 (1936), pp. 28, figs. 27*).—During the early stages, short-day (7-hr.) plants were lighter in color but soon matched with the long-day (14-hr.) plants, and at the time of sexual reproduction became intensely green. Seedlings of both groups, up to 14 days of age, were similar in rate of growth and development of organs, but from about that time the 14-hr. plants began to grow faster and were soon much taller, with thicker, softer stems and larger leaves. During the same period, the 7-hr. plants increased little in height but initiated and developed numerous flower buds on short, axillary shoots. The primary meristem region was almost obliterated as a result of the reduced internodes, making some of the flower buds and flowers appear terminal.

Histological observations of plants 21 or more days old indicated marked differences in development of the promeristem and internodes of the main stem and axillaries and in the rate of formation and maturation of the tissues produced from the promeristem of the plants in the two groups, details of which are given. In the 14-hr. plants, maturation of the meristematic cells was markedly delayed, thus providing for the initiation and further growth of various organs. Both the promeristematic and meristematic cells of the 7-hr. plants were larger but fewer than those of the 14-hr. plants, and mitotic figures were rarely seen.

The development of the axillary buds of both groups was similar up to the twenty-first day. The earliest sign of initiation of the first potential and possibly actual flower buds was in the 14-day-old plants exposed to the 7-hr. photoperiod, and unmistakable signs were evident at 21 days. On the twenty-fifth day, many flower buds had already reached a stage where the primordia of various floral organs and the early growth stage of the calyx were distinguishable histologically, and a week later many of these organs were visible to the unaided eye. On the forty-second day, a large number of buds had reached their maximum size and there were flowers in anthesis. The 14-hr. plants remained vegetative, with no sign of reduction in growth or initiation of reproductive organs.

Photoperiodic responses of certain greenhouse annuals as influenced by intensity and wavelength of artificial light used to lengthen the daylight period, R. B. WITHROW and H. M. BENEDICT (*Plant Physiol., 11 (1936), No. 2, pp. 225–249, figs. 9*).—The plants used in these studies at Purdue University were pansy (*Viola tricolor*), stock (*Matthiola incana*), and China-aster (*Callistephus chinensis*); the intensities of incandescent lamp radiation were 100, 10, 1, 0.3, and 0.1 footcandles; and the wavelengths included blue (380–510 mμ), green (455–550 mμ), yellow (530–650 mμ), orange red (650–? mμ), red (680–? mμ), extreme red (720–? mμ), and infrared (800–? mμ).

As to intensity, but little response differences were secured between 100 and 10 footcandles, and a very definite photoperiodic effect was induced by 0.3 footcandle and as low as 0.1 footcandle with China-aster. An increase in dry weight over the control was induced in all three species under all intensities of artificial radiation used. An increase in the top:root ratio also occurred in pansy and stock with increase in intensity.

As to wavelength, the orange and red caused the most marked photoperiodic response in all three species. The earliest blooming with pansy and stock and the most flowers with all three species occurred under these bands (especially the orange red), and in stock the greatest departure in branching habit. But little effect on flowering time occurred in pansy and stock under the blue, green,

or yellow, but in aster all wavelengths of additional light induced earlier flowering. The top: root ratio in all three species was greater under all wavelengths, the greatest ratio occurring under the orange red. The fresh weight was also greatest under orange and red radiation.

Biological effects of radiation: Mechanism and measurement of radiation, applications in biology, photochemical reactions, effects of radiant energy on organisms, and organic products, edited by B. M. DUGGAR (*New York and London: McGraw-Hill Book Co., 1936, vols. 1, pp. X+676, figs. 117; 2, pp. VII+677–1343, figs. 52*).—These volumes constitute a collective contribution, developed as a byproduct of activities of a committee now known as the Committee on Radiation, National Research Council, aiming to bring together "in the form of a survey a collation of the available material—theoretical, factual, and methodological—" to represent the present status of scientific knowledge in the five aspects chosen, viz, physics, photochemistry, certain biological products, zoology, and botany. The survey purposely excludes to a large extent practical considerations relating to plant production and certain other phases of applied radiology. Copious bibliographic references appear at the ends of chapters, and a subject index and alphabetical list of contributors are provided. The subject matter is taken up under the following chapter headings:

Photons and Electrons, by K. K. Darrow (pp. 1–42); Measurement of X-rays and Radium, by L. S. Taylor (pp. 43–85); Ionization and Its Bearing on the Biological Effects of Radiation, by G. Failla (pp. 87–122); Measurement and Application of Visible and Near-Visible Radiation, by F. S. Brackett (pp. 123–209); The Intensity of Solar Radiation as Received at the Surface of the Earth and Its Variations With Latitude, Altitude, the Season of the Year, and the Time of Day, by H. H. Kimball and I. F. Hand (pp. 211–226); Statistical Treatment of Biological Problems in Irradiation, by L. J. Reed (pp. 227–251); Photochemistry, by F. Daniels (pp. 253–302); The Effect of Radiation on Proteins, by J. H. Clark (pp. 303–322); Radiation and the Vitamins, by C. E. Bills (pp. 323–340); The Effects of Irradiation on Venoms, Toxins, Antibodies, and Related Substances, by S. C. Brooks (pp. 341–388); The Effects of Radium and X-rays on Embryonic Development, by E. G. Butler (pp. 389–410); Effects of X-rays and Radium Upon Regeneration, by W. C. Curtis (pp. 411–457); The Biological Effectiveness of X-ray Wave-Lengths, by C. Packard (pp. 459–471); The Physiological Effects of Radiation Upon Organ and Body Systems, by S. L. Warren (pp. 473–539); Short Electric Wave Radiation in Biology, by G. M. McKinley (pp. 541–558); Biological Effects of Alpha Particles, by R. E. Zirkle (pp. 559–572); Motor Responses to Light in the Invertebrate Animals, by S. O. Mast (pp. 573–623); The Action of Radiations on Living Protoplasm, by L. V. Heilbrunn and D. Mazia (pp. 625–676); Photoperiodism, by W. W. Garner (pp. 677–713); Plant Growth in Continuous Illumination, by J. M. Arthur (pp. 715–725); The Effects of Light Intensity Upon Seed Plants, by H. L. Shirley (pp. 727–762); Effects of Different Regions of the Visible Spectrum Upon Seed Plants, by H. W. Popp and F. Brown (pp. 763–790); Effect of the Visible Spectrum Upon the Germination of Seeds and Fruits, by W. Crocker (pp. 791–827); The Effects of Visible and Ultra-violet Radiation on the Histology of Plant Tissues, by J. T. Buchholz (pp. 829–840); Some Infrared Effects on Green Plants, by J. M. Arthur (pp. 841–852); The Effect of Ultra-violet Radiation Upon Seed Plants, by H. W. Popp and F. Brown (pp. 853–887); The Effects of Radiation on Fungi, by E. C. Smith (pp. 889–918); The Problem of Mitogenetic Rays, by A. Hollaender (pp. 919–959); Effects of X-rays Upon Green Plants, by E. L. Johnson (pp. 961–985); The Effects of

Radium Rays on Plants, by C. S. Gager (pp. 987–1013); The Light Factor in Photosynthesis, by H. A. Spoehr and J. H. C. Smith (pp. 1015–1058); The Influence of Radiation on Plant Respiration and Fermentation, by C. J. Lyon (pp. 1059–1072); Growth Movements in Relation to Radiation, by E. S. Johnston (pp. 1073–1091); Chlorophyll and Chlorophyll Development in Relation to Radiation, by O. L. Inman, P. Rothemund, and C. F. Kettering, (pp. 1093–1108); Radiation and Anthocyanin Pigments, by J. M. Arthur (pp. 1109–1118); Effects of Radiation on Bacteria, by B. M. Duggar (pp. 1119–1149); The Effects of Radiation on Enzymes, by H. A. Schomer (pp 1151–1165); Induced Chromosomal Aberrations in Animals, by T. Dobzhansky (pp. 1167–1208); Radiation and the Study of Mutation in Animals, by J. Schultz (pp. 1209–1261); Induced Mutations in Plants, by L. J. Stadler (pp. 1263–1280); Induced Chromosomal Alterations, by T. H. Goodspeed (pp. 1281–1295); Induced Chromosomal Alterations in Maize, by E. G. Anderson (pp. 1297–1310); and Biological Aspects of the Quantum Theory of Radiation Absorptions in Tissues, by J. W. Gowen (pp. 1311–1330).

Leaf temperatures and the cooling of leaves by radiation, O. F. CURTIS (*Plant Physiol., 11 (1936), No. 2, pp. 343–364, figs. 7*).—From these studies at Cornell University, it is concluded that "leaf temperatures may be considerably influenced by exchange of infrared radiation between the leaf and other materials near or at a distance from it. There may also be loss of heat by radiation to space. These effects are independent of the temperature of the air in the vicinity of the leaf because the oxygen and the nitrogen of the air are almost transparent to infrared radiation. It has been demonstrated, both under laboratory and field conditions, that leaf temperatures may be rapidly changed several degrees by allowing or preventing radiation to cold objects or to space. Rapid and great changes in temperature of leaves in direct sunlight are also brought about by natural or artificial changes in rates of air flow or light intensity. The presence of water in the atmosphere either as vapor or clouds may influence plant temperatures through its effect on infrared radiation. Data which have been taken by various investigators to demonstrate that leaves in direct sunlight may be cooler than the air are questioned on the basis that the readings for air temperatures were probably too high."

Seasonal study of tissue function and organic solute movement in the sunflower, O. A. LEONARD (*Plant Physiol., 11 (1936), No. 1, pp. 25–61, figs. 6*).—In this diurnal and seasonal study of sunflower plants at the State College of Washington, the sensitivity of young leaves to carbohydrate fluctuations was found to be not much greater than for old leaves, and high reducing sugar values in the former did not result in much higher sucrose values. Marked differences occurred between the carbohydrate proportions of leaves grown in Washington and in Michigan.

In both old and young leaves (1934 series) the simple sugars accounted for from one-third to one-half of the carbohydrates. The high sugar concentrations and fluctuations in the leaves were correlated with much smaller sucrose concentrations, favoring the idea that simple sugars are the first photosynthetic products.

Positive sucrose gradients were obtained for the bark—believed to be associated with the water percentage there rather than as indicating that sucrose is moving from "source" to "sink" on a gradient plan. The sucrose gradient from the head into the seed was negative—again associated with the percentage of moisture. The wood stored sucrose predominantly, and the pith the simple sugars—both also correlated with the moisture percentages. Simple sugars reached a maximum during the opening of the head and for a short time

thereafter. The pith was active in the synthesis of organic nitrogen (amino acids being most important) and also as a storage tissue. It was essentially void of sugars until flowering and early seed development. Nitrates were stored in the pith either early or late in the season, but during rapid growth of the head the nitrates stored early in the season decreased. Starch was almost absent from all parts of the plant except in the leaves during the day, at which time it, together with the acid-hydrolyzable material, removed from solution a part of the excess sugar not immediately translocated. The acid-hydrolyzable material, appearing as a temporary form, was nearly all translocated at night.

The diurnal fluctuations of soluble organic nitrogen in the leaves suggested that synthesis may occur there, and the low concentrations of ammonium and nitrate nitrogen suggested a rapid conversion of these forms into organic nitrogen. The data at least suggest that some of the organic nitrogen is synthesized outside the leaves, the most active regions appearing to be the upper pith and the head. Gradients of soluble nitrogen out of the leaves into the bark were always positive, but those of total soluble, amino, and ammonium nitrogen were nearly always negative up the stem (true for the bark, wood, and pith). Possibly some of the gradients appearing negative on a gross macrochemical basis were actually positive on the surface of colloids. Amides were often absent and never very abundant, and ammonium nitrogen was probably present as ammonium salts or held to the surface of colloids. As the seeds mature, large amounts of unused organic nutrients may collect in the different plant parts, this being most noticeable in the upper regions. The hourly moisture fluctuations in the leaf blades were not great, but the moisture content of the older leaves was always greater than that of the young leaves.

Effects of nutrient concentration on anatomy, metabolism, and bud abscission of sweet pea, G. T. NIGHTINGALE and R. B. FARNHAM (*Bot. Gaz., 97 (1936), No. 3, pp. 477–517, figs. 21*).—Plants in the more dilute solutions grew vigorously and were relatively succulent, the leaf blades were thin, somewhat circular in shape and dark green, and a comparatively high percentage of flower buds abscissed. Those in the more concentrated solutions grew less vigorously and were less succulent, the leaf blades were thick, oval or elliptical in shape, and light green, and a comparatively low percentage of flower buds abscissed. The roots and tops of plants in the less concentrated solutions were high in young, active cells with dense protoplasm, all tissues differentiated and matured slowly, carbohydrates were relatively low and organic nitrogen was high, a large part of the elaborated nitrogen occurred as amide and amino nitrogen, and nitrate was abundant. In the concentrated solutions all organs were relatively low in young cells with dense protoplasm, tissues differentiated and matured slowly, strongly developed fibers and other mechanical elements were present, carbohydrates were high and organic nitrogen was relatively low, a large part of the elaborated nitrogen occurred as complex proteins, and nitrate was abundant.

The anatomic, metabolic, and abscission phenomena are described in detail, the relationships of soil moisture and salt concentration are discussed, and the significance of the data revealed is pointed out. Mature, optically empty tissues give a condition of protein deficiency incorrectly called nitrogen deficiency. Such effects are especially severe in fruit trees, some grasses, and other perennials, because they carry on the initial phases of nitrate assimilation and protein synthesis almost exclusively in the fine, succulent rootlets, which mature and lose the ability to manufacture protein very rapidly when exposed to relatively concentrated solutions of salts. However, the roots can absorb nitrate and other nutrients freely when present in the nutrient solution.

Further studies on the relation between the carbon assimilation and nitrogen fixation in leguminous plants, C. E. GEORGI, F. S. ORCUTT, and P. W. WILSON (*Soil Sci., 36 (1933), No. 5, pp 375–382*).—Supplementing previous studies at the University of Wisconsin (E. S. R., 69, p. 183), "red clover plants were supplied with the same total quantity of CO_2 but at different partial pressures. Marked increases in the dry weight formed, nitrogen fixed, and number of nodules were observed as the pressure was raised from 0.03 percent to 0.1 percent. The observed increases are due to an increase in the pCO_2 supplied the plants, and not to the total quantity available.

"Red clover plants supplied with glucose and sucrose in the nutriment solution show an increase in both dry weight and nitrogen fixed, even in concentrations of carbohydrate as low as 0.1 percent. However, higher concentrations of the carbohydrate are more effective. The increases are more marked in plugged containers in which carbon assimilation in the controls (no carbohydrate) is limited and in which gas diffusion is lowered. The effect is probably due to liberation of CO_2 by bacteria with consequent increase in the pCO_2 in the neighborhood of the plant, and to actual absorption of the carbohydrate. The addition of mannitol to inoculated red clover plants does not cause an increase in nitrogen fixed. Concentrations of 0.25 to 0.5 percent mannitol appear to have a detrimental effect on the fixation of nitrogen by red clover.

"Red clover and sweetclover plants inoculated with a nonhomologous species of rhizobia (one that does not infect the plant) die of nitrogen starvation, even though a source of energy (carbohydrate) is furnished the bacteria. This indicates that soluble nitrogen compounds capable of being used by the plant are not fixed by free-living forms of rhizobia."

Changes in carbohydrate content of wheat plants during the process of hardening for drought resistance, I. M. and M. G. VASSILIEV (*Plant Physiol., 11 (1936), No. 1, pp. 115–125*).—Five varieties were hardened for drought resistance by growth with insufficient water until permanent wilting and necrosis of leaf tips had set in. Recovery was then induced by irrigation.

Analyses showed that at the beginning of wilting, monosaccharides and sucrose were increased and hemicelluloses decreased. At permanent wilting sucrose was decreased, monosaccharides were increased, and hemicelluloses decidedly increased (above the controls). With the beginning of irrigation the water content rose, but not as high as the controls, and the soluble sugars were decreased. After 8 days of recovery the drought-treated plants were still lower in water content than the controls, monosaccharides were low, and sucrose and hemicelluloses were increased. The conditions seemed to have become "fixed" as a result of the treatment. The significance of hemicelluloses in drought resistance of wheat is discussed.

Glutamine metabolism of the beet, H. B. VICKERY, G. W. PUCHER, and H. E. CLARK (*Plant Physiol., 11 (1936), No. 2, pp. 413–420*).—In this study at the Connecticut [New Haven] Experiment Station, when beets grown either in the field or greenhouse were treated with liberal amounts of ammonium sulfate solution in the soil the glutamine content of the roots rapidly increased, although the asparagine content was not affected. Daily applications were most effective. At the stage of definite toxicity a glutamine concentration of 5.4 percent of the dry weight of the roots was attained, but there was little effect on the composition of the tops until after severe injury had occurred.

In beets glutamine acts as a primary detoxifying agent for ammonia, but the function of asparagine in the general metabolism is not yet clear. Both nitrogen atoms of glutamine share in the reaction, and it is thus inferred that the precursor of the glutamine is nonnitrogenous. The reaction is believed to

proceed in two stages—a primary formation of glutamic acid and then a dehydration of the ammonium salt of glutamic acid to the amide.

The essential nature of certain minor elements for plant nutrition, W. E. BRENCHLEY (*Bot. Rev., 2 (1936), No. 4, pp. 173–196*).—The conclusions from this review are that the available evidence indicates small amounts of boron and manganese to be essential for the growth and health of many, if not all, plant species. Copper and zinc are also necessary in many cases, though it is still uncertain whether this need is universal. Only isolated cases of improvement due to traces of other minor elements have thus far been established. However, it may be that specific elements are necessary for specific plants, and possibly the conclusive evidence in hand for boron and manganese may lead the way to further research with results of far-reaching scientific and economic importance. A bibliography of 173 titles is appended.

Some effects of the heavy metals essential for the nutrition of Aspergillus niger upon its growth, R. A. STEINBERG (*Amer. Jour. Bot., 23 (1936), No. 3, pp. 227–231*).—The ratios of the yields with iron, zinc, copper, and manganese to those with one of these elements omitted varied with the heavy metal concentration and reached their maxima at the optimum concentration for growth (at least in acid solutions). Ion toxicity was displayed by these metals with growth and sporulation even at high dilutions. At a pH value of 6.0 or above a marked increase in the apparent optima of the heavy metals for growth occurred, since they served both as nutrients and chemically to increase acidity. A shift in the maxima of the yield and pH curves to the lower nutrient concentrations may occur with delay in the time of harvesting.

Injury to plants by fluorine and fluorine-silicon salts [trans. title], S. M. MASHTAKOV (MASCHTAKOW) and K. I. STRACHITSKII (STRATSCHIZKY) (*Trudy Nauch. Inst. Udobr. i Insektofungisid. (Trans. Sci. Inst. Fert. and Insectofungicides [Moskva]), No. 123 (1935), pp. 184–190, figs. 7; Ger. abs., p. 288*).—The action of fluorine and silicon-fluorine preparations on plants was studied by the laboratory method of determining root growth and in the field by observations on the "burned" areas induced. The results by both methods were in full agreement. Most of the fluosilicates proved more toxic than the fluorine salts. The sodium salts were less toxic than the potassium salts.

GENETICS

Genetical studies of bacteria, I, II, C. C. LINDEGREN (*Zentbl. Ba't. [etc.], 2 Abt., 93 (1935), No. 1–3, pp. 40–47, figs. 2; 93 (1935), No. 5–8, pp. 113–122*).—These studies are described as follows:

I. *The problem of the bacterial nucleus.*—This is a critical, theoretical discussion, from which it is concluded that the problem of the structure of bacterial protoplasm resolves itself into whether bacterial protoplasm is something totally different from that in any other known living form or whether it is possible to demonstrate the presence of nuclear structure within it either by cytological or genetical technic.

II. *The problem of bacterial variation.*—It is concluded that, as in fungi, bacterial variation may result from the operation of six mechanisms: Modification, mutation, transmissible nongenic variation, heterokaryosis, life cycle changes, and hybridization. It seems possible that in the evolution of bacteria genes may have been selected which are capable of mutating to a series of allelomorphs, each of which adapts the organism to some specific environment. In view of the large populations, even a slow rate of mutation could produce genotypes to insure adaptation over a wide range of environments.

Morphological and cytological studies on Fagopyrum esculentum.—II, Embryogeny, K. L. MAHONY (*Amer. Jour. Bot., 23 (1936), No. 2, pp. 129–133, figs. 29*).—The second of the series (E. S. R., 74, p. 180) deals with a study of embryo development in *F. esculentum*.

Studies in the cytology of wheat and of a wheat species hybrid, E. S. HORTON (*Amer. Jour. Bot., 23 (1936), No. 2, pp. 121–129, pls. 2, figs. 7*).—Microsporogenesis in the durum wheat Iumillo (14_{II}) is described, and the prophases are compared with those of Iumillo × Marquis ($14_{II} + 7_{I}$).

A general review of the inheritance of wool-characters in sheep, W. C. MILLER (*Empire Jour. Expt. Agr., 1 (1933), No. 2, pp. 173–192*).—In a contribution from the Institute of Animal Genetics, Edinburgh, the inheritance of wool characters is reviewed, including research on the inheritance of wool fineness, length, crimp, fleece weight and density, kemp, and related characters.

Wool characters in "Half-bred" sheep (Border Leicester rams×Cheviot ewes), J. E. NICHOLS (*Jour. Agr. Sci. [England], 23 (1933), No. 3, pp. 473–484, pl. 1, figs. 5*).—A study of the character of the wool in the first and second generation of Border Leicester × Cheviot sheep showed that the parental types appeared in the F_1 and F_2 generations. Such segregation suggested a multiple factor interpretation for the mode of inheritance of wool characters.

Gene relationships in two species of mice with reference to their possible evolutionary significance, C. V. GREEN (*Amer. Nat., 69 (1935), No. 720, pp. 19–29*).—A comparison of the genes of *Mus bactrianus* with the mutant forms of *M. musculus* suggests that the basic genes are essentially the same in both species.

Quantitative characters in reciprocal hybrids, C. V. GREEN (*Amer. Nat., 69 (1935), No. 722, pp. 278–282*).—No consistent differences between reciprocal crosses involving *Mus bactrianus* and *M. musculus* (E. S. R., 72, p. 602) were noted. Thus support is not afforded for a plasmatic hypothesis for size inheritance.

Further data on the existence of extra-chromosomal influence on the incidence of mammary tumors in mice, W. S. MURRAY and C. C. LITTLE (*Science, 82 (1935), No. 2123, pp. 228–230*).—Data on four types of backcrosses involving the incidence of mammary tumors in mice, suggest that extra chromosomal influences play an important role in the incidence of mammary tumors (E. S. R., 74, p. 475).

Effects of the flexed-tailed gene on the development of the house mouse, R. J. KAMENOFF (*Jour. Morph., 58 (1935), No. 1, pp. 117–155, pls. 2, figs. 3*).—A histological study of the flexed-tailed mice described by Hunt (E. S. R., 68, p. 746) and normal mice showed that the fusion of the vertebrae was due to the failure of the early cartilage of the intervertebral disk to differentiate normally on the fourteenth to fifteenth day of gestation. This is also associated with a general retardation in the early growth of the flexed-tailed embryos and the occurrence of an anemic condition 14 days after fertilization.

The analysis of the organismal differentials of gray Norway rats and of two mutant races by means of transplantation, L. LOEB and H. D. KING (*Amer. Nat., 69 (1935), No. 720, pp. 5–18*).—Studies of the response of syngenesiotransplantations, homoiotransplantations, and intermutant transplants in gray Norway, mutant albino, and curly coat rats led to the conclusion that the differences in the severity of reactions between homoiogenous and interracial transplantations are real, and that single mutations such as cause change from gray Norway to curly coat may have a definite effect on the organismal differential.

A lethal mutation in the rabbit with stigmata of an acromegalic disorder, C. K. HU and H. S. N. GREEN (*Science, 81 (1935), No. 2088, pp. 25, 26*).—A lethal

mutation in the rabbit, resembling an acromegalic disorder and involving the appearance in the young animals of a faint redness with an edematous thickening of the skin over the nape of the neck, between the shoulders, at the base of the skull, behind the ears, or under the chin, and subsequently over the whole ventral surface of the body, was considered to be due to the operation of a single recessive factor. Some heterozygous normal males exhibited symptoms in early life. The condition fits in with the syndrome associated with over-activity of the growth-promoting hormone of the pituitary.

Experiments on inbreeding of poultry ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul. 83 (1934), pp. V+59, figs. 5*).—Studies of the effects of father-to-daughter matings when the sire and dam were not brother and sister were carried out from 1925 to 1931 at the National Institute of Poultry Husbandry, England, with high-producing strains of White Wyandottes, Rhode Island Reds, and White Leghorns. Matings of the same sires with nonrelated birds served as controls. The results showed that the progeny of the inbred matings were generally inferior to the controls in vigor, annual production, fertility, and hatchability of the eggs, chick mortality, age and weight at sexual maturity, and laying house mortality.

A ten year inbreeding experiment in the domestic fowl, N. F. WATERS and W. V. LAMBERT (*Poultry Sci., 15 (1936), No. 3, pp. 207–218, figs. 9*).—The results are presented on the effects of inbreeding on vigor and egg production in three lines of Single Comb White Leghorns at the Iowa Experiment Station. The approximate amounts of inbreeding attained were 83, 61, and 41 percent in the different lines. Records were obtained on all female chicks that survived, but hatchability was an important character, for which selection was made in continuing the lines with other characters such as fertility, early maturity, egg size, body size, egg production, and viability considered insofar as practicable. Fertility, hatchability, and egg production were well maintained in all three lines, and the inbreeding seemed to have no general effect on egg size or earliness of maturity.

Inbreeding in the White Leghorn fowl, N. F. WATERS and W. V. LAMBERT (*Iowa Sta. Res. Bul. 202 (1936), pp. 55, figs. 32*).—This is a more detailed report of the effects of inbreeding in the domestic fowl on egg production, fertility, hatchability, and other characteristics of vigor than that noted above. Results are also included on a total of six inbred families.

Continued research upon variation and heredity of some characters in White Leghorns, Rhode Island Reds and Barnevelders, J. AXELSSON (*Lantbr. Högsk. Ann. [Uppsala], 1 (1933–34), pp. 69–207, figs. 6*).—A report is given of the variation in and heredity of egg weight in the crosses of White Leghorn, Rhode Island Red, and Barnevelder breeds, previously noted (E. S. R., 72, p. 603). The variability of the weight of the eggs laid by the different breeds and crosses between them is presented, together with the correlations of egg weight with seasonal and other conditions including breed relationships.

Positive correlations were obtained between the weights of the eggs laid by dams and daughters.

Correlations between egg production were also presented.

Some sex-linked crosses, R. T. PARKHURST, H. M. MOLYNEUX, B. CHAMBERLAIN, and F. H. JONES (*Poultry Sci., 13 (1934), No. 4, pp. 202–207*).—Experiences in the accuracy with which sex can be determined at hatching in birds produced in the following crosses are described: White Bresse × Single Comb White Leghorn; Single Comb Black Minorca × Single Comb White Leghorn; Single Comb Black Leghorn × Barred Plymouth Rock; Single Comb Black Leghorn × Single Comb Cuckoo Leghorn; Single Comb Cuckoo Leghorn × Single Comb Rhode Island Red; Brown Sussex × Light Sussex; and Single Comb Rhode

Island Red × Light Sussex. The use of shank color for sex determination did not prove of sufficient accuracy to be of economic value, but no difficulty was experienced in determining sex at hatching with the gold and silver matings, black and barred matings, and rate of feathering, provided the birds used were pure for the sex-linked factors involved.

Black beak was found to be inherited as a sex-linked dominant factor to horn beak color in the Black Leghorn × Cuckoo Leghorn cross.

A Brahma-Plymouth Rock mosaic, E. ROBERTS and J. H. QUISENBERRY (*Jour. Heredity, 26 (1935), No. 1, pp. 11–14, figs. 3*).—A mosaic with a Barred Plymouth Rock mother and probably a Brahma father showing the characteristics of the Plymouth Rock on the right side of the body and the Brahma on the left is described. The possibility of the condition being due to the loss of two autosomes is discussed.

Weight and size of organs in Frizzle fowl, W. LANDAUER and E. UPHAM ([*Connecticut*] *Storrs Sta. Bul. 210 (1936), pp. 42*).—In continuing studies of the weights of the organs in Frizzle fowls (E. S. R., 75, p. 613), a comparison was made of the weights of the blood, heart, lungs, spleen, liver, adrenals, kidneys, pancreas, crop, and gizzard lining, of the length and weight of the proventriculus, gizzard, duodenum, small intestine, ceca, and large intestine, and of the intestinal volume of three age groups of Leghorns and homozygous Frizzle fowls, averaging approximately 800, 485, and 160 days of age. Comparisons were considered of the ratio of organ weight to net body weight (weight with feathers removed), ratio of cube root of the organ weight to the length of the dorsum, and the ratio of the organ weight to the two-thirds power of the net body weight.

Considering the several indices of comparison, it is concluded that Frizzle chickens show definite increases in the relative weights of thyroids, heart, blood, spleen, kidneys, adrenals, pancreas, crop, and gizzard and in the capacity of the intestinal tract. Distinct differences in the fat deposits of Frizzle and normal chickens were observed. Young Frizzles were almost without fat deposits, while older Frizzles tended to have excessive fat accumulations. The increased rate of metabolism is associated with increased size of the thyroids and adrenals. Other changes in the organs were directly connected with the loss of body heat and increased metabolic rate associated with it.

Lessened water vaporization conserves body heat and is probably associated with the lack of enlargement of the lungs.

Although it is concluded that the Frizzle gene is directly responsible for only the plumage defect, it seems likely that residual heredity plays an important role in determining the degree of variation in organs and functions and their relation to survival.

Inheritance as a factor in poultry disease, W. V. LAMBERT (*Poultry Sci., 14 (1935), No. 3, pp. 131–136*).—A discussion of the possibilities of disease control through genetic methods, including findings indicative of promise with specific diseases.

The study of the conditions and factors affecting hair growth in the guinea-pig, D. H. STRANGEWAYS (*Jour. Agr. Sci. [England], 23 (1933), No. 3, pp. 359–378, pls. 2, figs. 7*).—Detailed studies show that hair growth on defined areas of the skin varies with the age and condition of the animal, season, and temperature.

The development of the mammary glands of the goat, C. W. TURNER and E. T. GOMEZ (*Missouri Sta. Res. Bul. 240 (1936), pp. 22, figs. 33*).—According to this description, the first evidence of the mammary apparatus was observed as a light streak at the twenty-fifth day of gestation. By the eighty-eighth day the cistern of the teat and gland was formed with some secondary sprouts. The

duct system develops during the balance of fetal life, and at birth the udder consists of a cistern and duct system which extends only a short distance into the fatty tissue of which the udder is composed. The duct system continues to grow after sexual maturity and the recurrence of oestrous cycles, but the formation of true alveoli was not apparent in nulliparous does. During the first half of gestation, proliferation of the lobule-alveolar system takes place, with an accumulation of secretion and enlargement of the lumina of the alveoli during the last half of gestation.

Preparation of avian sperm smears for microscopy, S. S. MUNRO (*Science, 83 (1936), No. 2161, pp. 532*).—Methods for fixing and staining the elongated heads of avian sperm with a minimum of distortion are described. The methods involve fixation in osmic acid vapor or instantaneous drying of thin smears.

Studies and investigations into the corpus luteum hormone, K. PORTMAN, trans. by A. ANDERSEN (*Acta Path. et Microbiol. Scand., Sup. 25 (1935), pp. 124, figs. 16; Dan. abs., pp. 118–121*).—The influence of corpus luteum hormone on the sexual cycle is reviewed, and the results of experiments dealing with the effect of corpus luteum extracts on gestation and parturition in the rabbit and its therapeutic use in cases of menorrhagia in humans are described.

Hormones in the urine following oophorectomy during pregnancy, H. ALLAN and E. C. DODDS (*Biochem. Jour., 29 (1935), No. 2, pp. 285–287*).—Bilateral oophorectomy in a woman in pregnancy had no influence on the anterior hypophyseal hormone content of the urine, but the oestrone content was definitely decreased.

Differences between anterior pituitary sex-stimulating hormones and pregnancy-urine substances as tested in the male mammal and bird, J. A. SCHOCKAERT (*Amer Jour. Physiol., 105 (1933), No. 3, pp. 497–507, fig. 1*).—Differences between the effects of pituitary extracts and pregnancy urine on the male genital system of rats, ducks, and chicks were studied. It was found that the weight of the testes of immature rats was increased both by pituitary extracts and pregnancy urine extracts. However, pregnancy urine extracts had no effect on the duck and chick, although pituitary extracts markedly increased the weight of the testes and comb development in the chick, with early spermatogenesis.

A study of theelin prepared from human and mare urine and from theelol, with some remarks on the preparation of theelin from mare urine, J. M. CURTIS, D. W. MACCORQUODALE, S. A. THAYER, and E. A. DOISY (*Jour. Biol. Chem., 107 (1934), No. 1, pp. 191–205*).—Theelin was isolated from the urine of pregnant mares by its insolubility in acid aqueous media and was found not to be significantly different from theelin isolated from human urine or theelol.

Histology of the ovary of hypophysectomized rats treated with urinary hebin, N. J. WADE (*Soc. Expt. Biol. and Med. Proc., 31 (1933), No. 3, pp. 321, 322*).—Hebin from pregnant urine administered to rats immediately after hypophysectomy failed to inhibit ovarian degeneration. The ovaries were converted into a lutein mass. Similar results were obtained when the administration of hebin following hypophysectomy was delayed.

Variation in plumage response of Brown Leghorn capons to oestrone, I, II, A. W. GREENWOOD and J. S. S. BLYTH (*Roy. Soc. [London], Proc., Ser. B., 118 (1935), No. 807, pp. 97–132, pls. 4, figs. 13*).—Two papers in this series are presented from the Institute of Animal Genetics, Edinburgh.

I. *Intramuscular injection.*—Feather responses, as a result of the administration of standardized intramuscular doses of oestrone to 87 Brown Leghorn capons ranging from 7.5 mo. to 5.5 yr. in age, were variable, some showing only an axial spot of red on the rachis, whereas others varied all the way up to a wide band stretching from one side of the feather to the other. Attempts to

correlate the variability with other conditions suggested the role of both genetic and physiological factors. Season and body weight did not show significant correlation, although the response increased with the age of the birds. Growth rate of the feathers was not a significant factor in determining the response.

II. *Intradermal injection.*—Intradermal injections of small doses of oestrone into 15 Brown Leghorn capons resulted in feather response in newly developing feathers growing in the area where the injections were made. The local nature of the response indicated that the replacement of black by red was a direct one The induced bars of red pigment were frequently unsymmetrical.

The pattern and symmetry of adult plumage units in relation to the order and locus of origin of the embryonic feather papillae, A. HOLMES (*Amer. Jour. Anat., 56 (1935), No. 3, pp. 513–537, pl. 1, figs. 6*).—A study of the origin of feather follicles showed that in the fowl the appearance of the feathers follows a definite order in each tract and in relation to other feather tracts.

Vitamin E and the gonads, W. SAPHIR (*Endocrinology, 20 (1936), No. 1, pp. 107, 108*).—Intraperitoneal injections of wheat germ oil had no influence in bringing about oestrum in castrated rats, increased activity of the ovaries, or stimulating luteinization. There was no evidence to suggest that vitamin E was of value in the treatment of primary sterility in the female.

Fundamental similarity in the development of gonadotropic response in the immature guinea pig and rat, S. C. FREED and A. COPPOCK (*Endocrinology, 20 (1936), No. 1, pp. 81–85, figs. 3*).—Administration of pregnancy urine extracts to immature rats and guinea pigs ranging in age up to maturity was found to have essentially the same effect on both kinds of animals except that the time intervals differed. The results are graphically expressed.

Occurrence of uniovular twins in multiple births, C. V. GREEN (*Science, 80 (1934), No. 2087, p. 616*).—In a back-cross generation involving the mouse species *Mus musculus*, with the recessive genes *d*, *b*, and *a*, and *M. bactrianus*, with the corresponding dominant allelomorphs *D*, *B*, and A^w, eight color combinations were expected (E. S. R., 68, p. 316). There was a significant excess of litter mates of the same sex and color among the progeny of the F_1 females, but the progeny of the F_1 males did not show this excess, this being accounted for as indicative of the occurrence of uniovular twins.

FIELD CROPS

Studies in experimental technique: The balanced block arrangement of treatments, R. J. BORDEN (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 40 (1936), No. 2, pp. 113–116, fig. 1*).—The method described, with application to a rate of nitrogen fertilization test with sugarcane, is said to reduce definitely the amount of border effect between treatments and to make allowance for any definitely natural "fertility slope" that may exist within the test area. Furthermore, the more accurate yield data secured from this arrangement are suitable to statistical interpretation by the analysis of variance.

[Field crops experiments in Alaska, 1934] (*Alaska Col. Sta. Bul. 4 [1935], pp. 8–10, 12, 13, 16–26, 37–41, 44–46, 48, 49, figs. 7*).—Agronomic studies (E. S. R., 73, p. 30), carried on at the station and Matanuska Substation and reviewed briefly, included variety trials with barley, wheat, oats, potatoes, forage legumes, timothy, and other pasture and lawn grasses; fertilizer tests with potatoes, bromegrass, hay, and wheat; crop rotations; and costs involved in growing vetch, field peas, oats, oats and vetch, and potatoes in a rotation scheme and in haymaking operations.

[Field crops experiments in Indiana] (*Indiana Sta. Rpt. 1935, pp. 14, 15–19, 58, 62, figs. 2*).—Agronomic studies (E. S. R., 73, p. 170), again reported

on briefly, dealt with top dressing wheat with soluble nitrogen in April; effects of legumes in the rotation and also of phosphorus and potash on yields of corn and wheat; variety tests with alfalfa; trials of Kobe lespedeza and *Lespedeza sericea;* time of planting tests with corn; studies of the quantitative amounts of carotenoid pigments in different varieties and strains of winter wheats; research on the granulation test of whole wheat meal; improvement of wheat in southwestern Indiana by premiums for quality, seed cleaning, and control of wild garlic; and effect of nutrition on the proportion of vitreous kernels in wheat.

[Farm crops experiments at the Moses Fell Annex Farm, Bedford, Ind.], H. J. REED and H. G. HALL (*Indiana Sta. Circ. 219 (1936), pp. 10–13, fig. 1*).—The average acre yields in variety trials with oats, winter wheat, rye, and barley, and soybeans for grain and hay, and average yields of spring barley, wheat, and rye are tabulated as heretofore (E. S. R., 72, p. 35), with brief accounts of the response of pasture to manure, lime, and fertilizer, and a comparison of clover, alfalfa, sweetclover, Korean lespedeza, and timothy in rotation with corn and wheat.

[Field crops research in Rhode Island] (*Rhode Island Sta. Rpt. [1935], pp. 6–8, 13–16*).—Brief reports are made on the progress of variety tests with potatoes, soybeans, and lawn and turf grasses; fertilizer experiments with potatoes, mangels, alfalfa, and lawn and turf grasses, including Kentucky bluegrass, and varieties and strains of bents; response of oats, timothy, and clover to different levels of soil reaction; comparison of steamed v. unsteamed composts and trials of nitrogen-supplemented composts for freedom of turf from weeds; residual effects of different levels of fertilizer; effects of crops on succeeding crops; crop rotation; control of lawn pests and weeds; and seed production of bentgrass varieties and strains.

[Field crops experiments in Tennessee], H. P. OGDEN, S. H. ESSARY, G. A. SHUEY, B. D. DRAIN, L. R. NEEL, B. P. HAZLEWOOD, and F. S. CHANCE (*Tennessee Sta. Rpt. 1934, pp. 7–9, 14, 15, 16, 22, 29, 32, 33, 34, 35–37, 38, 39*).—Progress results are reported from agronomic research at the station and substations (E. S. R., 73, p. 171), including breeding work with cotton, oats, barley, red clover, and winter peas; variety tests with cotton, wheat, rye, potatoes, sweetpotatoes, lespedeza, alfalfa, and tobacco; tests of Tennessee anthracnose-resistant clover grown in Western States for several years; cultural (including planting) experiments with cotton, rye, potatoes, and *Lespedeza sericea;* a cutting test with annual lespedeza; seed treatment tests with *L. sericea;* a trial of a corn-sorgo silage combination; sowing oats, barley, and rye and a grass mixture on bluegrass and Bermuda sod; comparison of winter cover crops; fertilizer trials, lint studies, and pollen germination tests with cotton; crop rotations; and pasture experiments. Several lines of work were in cooperation with the U. S. Department of Agriculture.

The genera of grasses of the United States, with special reference to the economic species, A. S. HITCHCOCK (*U. S. Dept. Agr. Bul. 772, rev. (1936), pp. 302, pls. 20, figs. 183*).—A revision by A. Chase of the bulletin noted earlier (E. S. R., 42, p. 828). See also a later note (E. S. R., 73, p. 465).

Native grass behavior as affected by periodic clipping, W. B. GREENER (*Jour. Amer. Soc. Agron., 28 (1936), No. 6, pp. 447–456, fig. 1*).—In a special study within a virgin-grass clipping experiment at the Oklahoma Experiment Station, wherein variously clipped and fertilized plats were compared with pasture and roadside plats, clipping native grass more than twice a year did not return enough additional production in the fifth year to pay for the labor, and production declined as the number of clippings increased. The most air-dry hay was obtained from a plat clipped twice and manured 6 yr. before at the rate of

10 tons with 400 lb. of 20 percent phosphate per acre. The least top weight was secured from plats clipped 8, 9, and 10 times annually. The greatest root weight came from unmolested roadside grass and then from an untreated plat clipped 5 times a year, from one plat clipped twice a year but receiving manure and phosphorus, and from a check plat, while the least root weight came from plats clipped oftenest and which also produced the least top weight. The greatest root volume was obtained from plats with greatest root weight, and the lowest root volume was on the pastured area, on a check plat, on the manured plat, and on a plat clipped 10 times a year. The roadside, check, and nitrated plats and a manured plat produced the highest root weight-volume factor. The lower root weight-volume factors were obtained on those areas clipped more often.

The soil moisture was greatest on unclipped plats and greater in the various horizons on plats less frequently clipped. For the average of the 14 plats the 1- to 3-in. horizon contained the most soil moisture, the 12- to 15-in. horizon second, and the 6- to 9-in. horizon third in the sixth year. The lowest soil moisture in the upper horizon was found in the unclipped plats, in the second horizon in a plat receiving manure and phosphate, and in the third horizon in the most frequently clipped plats. Soil organic matter was greatest in the upper horizons and in a plat receiving manure and phosphate, in one of the plats receiving sodium nitrate, and in an unclipped plat. Low soil organic matter was not always found where expected and did not appear to be associated with the amount of live roots. If soil organic matter content is quite permanently residual, it must be the result of previous vegetative growth.

The pH was highest in the upper horizon on plats manured and phosphated, but clipped only twice a year. It was also high on unclipped, pastured, and roadside plats, but was highest in the lower (12- to 15-in.) horizon of plats clipped 5 times, one of which received manure and phosphate. The lower horizon produced the highest average pH readings. The lowest pH reading was found in the 6- to 9-in. soil horizon of a plat clipped 9 times annually, and other low pH readings were distributed through the various horizons.

The Longleat experiments, 1927–1931, A. W. Ling, W. R. Muir, and J. D. Nutt (*London and Bath: Mendip Press [1934], pp. 29, fig. 1*).—This is the result of a pasture grazing test extending over a 5-yr. period, the grazing returns being expressed in terms of cow days per acre.

Little difference was noted in returns from intensive rotational grazing and extensive grazing on unfertilized areas, while systematic applications of complete fertilizer under intensive grazing increased returns by 27 percent and 25 percent, respectively, over unfertilized areas intensively and extensively grazed. Nitrogenous fertilizer alone gave disappointing results, while phosphorus and potash application encouraged legumes on the sod but did not materially increase carrying capacity. Complete fertilizer increased the protein and mineral content of the herbage, particularly the phosphorus content. All treatments were ineffective unless accompanied by favorable temperature and rainfall.

Hays and haying methods for the Upper Peninsula, B. R. Churchill (*Michigan Sta. Quart. Bul., 18 (1936), No. 4, pp. 211–217, figs. 3*).—Haymaking experiments and trials of hay mixtures at the Upper Peninsula Substation, 1929–35, showed that the length of time required for curing hay at Chatham was largely influenced by prevailing weather, moisture content at cutting, yield, and type of hay. At cutting, legumes contained more moisture than timothy, and the latter usually was ready to store sooner. The value of addition of timothy to legumes grown for hay as an aid to curing seemed questionable unless timothy predominates in the mixture. The importance of such mixture at Chatham is that timothy will grow on spots not occupied by legumes and thus

help to keep out weeds. Where satisfactory stands of legumes are obtained, addition of more than a small percentage (not over 10 percent) of timothy is considered wasteful, since inclusion of large amounts of timothy seed in the mixture was no assurance that timothy would predominate therein. Timothy when grown in such mixtures was darker green, leafier, and taller, and contained a higher percentage of protein than timothy grown alone. Swath-curing generally was the more rapid curing method, although legumes left in the swath too long lost a large percentage of their leaves and the quality of hay was poor. Partial curing in the swath until the hay was well wilted, followed by windrow-curing, resulted in better hay than from complete swath-curing. Seeds mixtures and curing suggestions are included.

Humidity control in large chambers by means of sulfuric acid solutions, F. J. ZINK and C. O. GRANDFIELD (*Jour. Amer. Soc. Agron., 28 (1936), No. 6, pp. 463–466, figs. 2*).—The humidity control cabinets described were used at the Kansas Experiment Station in connection with studies on the influence of atmospheric humidity on the rate of drying of alfalfa and the effect of humidity on the seed setting of alfalfa plants, conducted in cooperation with the U. S. Department of Agriculture.

Ladino clover for western Oregon, H. A. SCHOTH (*Oregon Sta. Circ. 117 (1936), pp. 8, figs. 2*).—Practical information, based on experiments and observations in cooperation with the U. S. D. A. Bureau of Plant Industry, is given on the characteristics and climatic and soil needs of Ladino clover (*Trifolium repens latum*), seedbed preparation and planting practices, and on handling the crop for pasture, hay, and seed.

Corn planting and cultivation, compiled by C. F. CLARK (*Mississippi Sta. Bul. 312 (1936), pp. 25*).—Information compiled from reports of experiments made by State experiment stations and the U. S. Department of Agriculture covers date and method of planting, seedbed preparation, methods of cultivation and their effects on yield, topping corn, and pulling fodder.

Corn varieties for silage in Rhode Island, T. E. ODLAND and H. C. KNOBLAUCH (*Rhode Island Sta. Bul. 257 (1936), pp. 14, figs. 2*).—Variety tests with silage corn, 1931–34, comparing a late, three medium, and four early corns, showed the late Eureka to average the most green material, 21.17 tons per acre, and the most dry matter, 7,907 lb., while West Branch Sweepstakes, a medium dent, surpassed Eureka in yield of protein, 446 lb., and total nutrients, 5,405 lb. The very early varieties were found to yield too low for silage purposes. For the average dairyman of the State who wants as much feeding value per acre as possible without handling excessive water in green material, the choice of a medium-maturing variety as West Branch Sweepstakes seems advisable. Where the season is longer a later type may be used. In general, a variety that will reach the dough stage in the average season appears most desirable for silage purposes.

Hybrid corn, A. N. HUME and C. J. FRANZKE (*South Dakota Sta. Bul. 299 (1936), pp. 28, figs. 12*).—A popular discussion of inheritance in corn, with special emphasis on the effects of inbreeding and hybridization, is presented, together with the comparative yields of several hybrids and varieties of corn at the station, 1931–35, and yields and stands of a number of hybrids and varieties at Beresford in 1935. Records of the annual rainfall by months at the station, Centerville, Highmore, Eureka, Cottonwood, and Vivian are appended (pp. 22–28).

Michigan hybrid No. 561 a borer-resistant field corn, A. R. MARSTON (*Michigan Sta. Quart. Bul., 18 (1936), No. 4, pp. 223–225, figs. 2*).—Hybrid No. 561, a uniform, vigorous, productive dent corn, exhibiting resistance to Euro-

pean corn borer and said to be suited only for the southern part of Michigan, is described as a top cross between S–10 (a synthetic variety made by blending 91 inbreds) and an inbred strain. All the inbreds involved have Maize Amargo breeding (E. S. R., 69, p. 513) and have shown strong indications of resistance to borer attack.

Hail damage to corn, J. C. ELDREDGE (*Iowa Sta. Bul. 348 (1936), pp. 303–322, figs. 7*).—This is a popular abridgment of certain phases of Research Bulletin 185 (E. S. R., 73, p. 775).

The effect of variety, planting date, spacing, and seed treatment on cotton yields and stands, G. A. HALE (*Jour. Amer. Soc. Agron., 28 (1936), No. 5, pp. 364–369*).—The average results (1930–34) of a multiple-factor field experiment at the Georgia Experiment Station, including five cotton varieties and several planting dates and spacings and a seed treatment, are reported. This type of experiment was found to have a number of advantages over the common single variable field experiments.

Half and Half and Stoneville 2 led in yields when all planting dates were averaged. The differences in varietal response to the different planting dates indicate that the date of planting of varietal experiments may markedly affect the relative yields of the varieties and the value of the results for making varietal recommendations. The varieties showed some significant differences in ability to produce satisfactory stands, especially when planted early or during late March. The early (late March) planting and the medium (late April) planting produced the same 5-yr. average annual yields of lint, while the late (late May) cotton yielded only about one-half as much lint. Stands were poorest on the earlier planted cotton and thickest in May plantings.

When Stoneville 2 was grown, 1932–34, in 3.5-ft. rows, unthinned in 1-ft. and 3-ft. hills, and thinned to two plants in hills 1 ft. apart, the last spacing produced the highest yields, except for the medium planting date, when unthinned cotton in 1-ft. hills equaled thinned cotton spaced 1 ft. apart. The unthinned cotton was relatively poorer when planted late than for the other dates. Number of hills or the distribution of the plants rather than the total plants per acre is most important in spacing experiments. Planting date may affect the ratings of different spacings in cotton spacing experiments.

Where the cotton was planted early, although stands were somewhat irregular in some seasons, there was no significant correlation between acre yield and the total plants per acre and only a slightly significant correlation between yield and number of hills per acre. Similar results were had for late planted cotton with good stands every year. The medium planting showed a highly significant, positive correlation between lint yield and both number of plants and hills per acre. The number of hills on the variety plats, like those on the spacing plats, was correlated more closely and positively with the pounds of lint cotton produced than with the number of plants per acre.

Treating the Stoneville 2 cottonseed with an organic mercury compound had no significant effects on stands or yields.

Part I, Report on gins in Louisiana and the proper ginning of cotton, G. A. GERDES. **Part II, Introduction and summary of U. S. Department of Agriculture Technical Bulletin No. 503 entitled "Effects of Gin-Saw Speed and Seed-Roll Density on Quality of Cotton Lint and Operation of Gin Stands",** C. A. BENNETT and F. L. GERDES (*Louisiana Sta. Circ. 16 (1936), p. 7*).—The first part of this report presents a summary of experience on gin operation in Louisiana; the second part summarizes a publication previously noted (E. S. R., 75, p. 117).

Flax: Experimental studies in growing, decorticating, chemical degumming, and manufacturing into yarns and papers, H. H. WILLIS (*Washington:*

Textile Found., [*1936*], *pp. 32, figs. 6*).—Findings in fiber flax experiments, 1934–35, are presented in brief reports entitled Growing of Flax (Crops of 1934 and 1935), by L. H. Dewey (pp. 6–11); Mechanical and Chemical Processing of Flax by the New Method (pp. 12–19) and Spinning of Flax Fiber (Crop of 1934) (pp. 20–30), both by H. H. Willis; and Possible Use of American Flax in the Paper Industry, by W. E. Emley and H. U. Kiely (pp. 31, 32).

Fiber flax in Oregon, B. B. ROBINSON (*Oregon Sta. Circ. 118 (1936), pp. 12, figs. 2*).—Certain practices found most successful in fiber flax production under Willamette Valley conditions are outlined on the basis of experience and research in cooperation with the U. S. D. A. Bureau of Plant Industry. The information covers the flax contract, distribution, climatic and soil adaptation, rotations, fertility needs, seedbed preparation and planting, and curing and harvesting the crop, and flax mill operations which have some bearing on production problems.

Effect of planting date on rate of sprout emergence and multiple sprouting of tubers of the Jerusalem artichoke, C. E. STEINBAUER (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 617–621*).—Time of planting tests, 1931–33, with several varieties of Jerusalem-artichokes revealed that delay in planting (up to about May 15) resulted in fewer days for sprout emergence from the soil, more stems per seed piece, general reduction in weight of tops, reduced yields (after May 1), and fewer tubers in plantings after April 15. The loss of dominance observed with delayed planting appeared from these results to be similar in the Jerusalem-artichoke and the potato.

Cultural and storage research with potatoes, E. V. HARDENBERG (*Amer. Potato Jour., 13 (1936), No. 2, pp. 38–44*).—This review, a contribution from Cornell University, deals with ecological and seed studies and variety, cultural, and storage tests, and lists 29 titles.

Potato nutrition and soil fertility studies in 1935, O. SMITH (*Amer. Potato Jour., 13 (1936), No. 2, pp. 44–52*).—Summarizing the work on mineral nutrition, fertilization, and soil fertility, as applying to the potato, this report lists 50 titles.

Influence of fertilizers on maturity and type of potatoes, F. M. HARRINGTON (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 560–562*).—Phosphorus applications in growing Russet Burbank potatoes, as shown by Montana Experiment Station tests, have resulted in better maturity and handling qualities, better netting, improvement in type, and an increase in percentage of better shaped potatoes, resulting in heavier yields of No. 1 potatoes. Nitrogen and also potassium delayed maturity, and these two elements either alone or in combination had other effects which are discussd briefly.

Influence of fertilizer on potato maturity and type, F. M. HARRINGTON (*Amer. Potato Jour., 13 (1936), No. 8, pp. 218–220*).—Essentially noted above.

Effect of soil reaction on yield and market quality of potatoes, O. SMITH and G. C. MOORE (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 563–565*).—The response of Smooth Rural potatoes to a range of soil reactions in percentage of scabby tubers is reported for the period 1932–35, supplementing information given in an earlier note (E. S. R., 71, p. 624).

Non-legumes as green manures for potatoes, J. BUSHNELL (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 566–568*).—Potato yields in ordinary farm rotations on the silt loam at the Ohio Experiment Station were not satisfactory with chemical fertilizers alone. The somewhat better yields where manure was applied seemed due in part to an increased aeration of the soil, for similar benefits were obtained by addition of sand to the soil (E. S. R., 73, p. 470). Corn as a green manure (E. S. R., 71, p. 768) provided more organic matter to plow under and resulted in larger potato yields than have soybeans or sweetclover.

No serious practical problems arose from the nitrogen deficiency resulting from turning under much low-nitrogen organic matter nor were they encountered in either plowing or disking down corn. The nitrogen requirements of the potatoes were met by including from 40 to 80 lb. of nitrogen per acre in the regular potato fertilizer.

Experiments with potatoes on muck soil, J. BUSHNELL (*Ohio Sta. Bul. 570 (1936), pp. 25, figs. 7*).—Variety, planting date, fertilizer, depth of planting and control of *Rhizoctonia*, spacing, irrigation, and spraying experiments carried on in 1932–35 at the Muck Crops Experiment Farm near McGuffey in Hardin County are reported, with comments on frost prevention and recovery and the possibility of producing seed potatoes on muck.

Muck appeared to be the best soil in Ohio for potatoes, yields at the experiment farm exceeding those on farms located on Wooster silt loam or Chenango fine sandy loam. However, frosts may be serious on muck soils.

Irish Cobbler gave good yields from May 20 to 25 plantings, and earlier plantings gave higher yields in the two seasons free from June frosts. Russet Rural and White Rural matured about 2 weeks later than Irish Cobbler, and since early frosts had not occurred at the farm, equaled or surpassed Irish Cobbler in yield. The Rurals tend to develop growth cracks in seasons that favor rapid growth. In 2 of 3 yr. Irish Cobblers from the experiment farm were very satisfactory for seed for the early crop in southern Ohio.

Potash was the only fertilizer constituent that gave large yield increases. Results to date suggest potash fertilizer alone to supply 270 lb. of potash per acre, or 750 lb. of an 0–9–36 mixture. Highest yields resulted from a planting depth of 3 in. At that depth, and with shallow covering at planting, *Rhizoctonia* did not appreciably reduce the stand when the seed was relatively free from *Rhizoctonia* or when infected seed was treated properly. Spraying at weekly intervals during the period of rapid growth has been advisable for controlling leafhoppers and flea beetles. Both overhead and subirrigation increased yields, subirrigation seeming practicable on a field scale.

The Katahdin potato in Michigan, H. C. MOORE and E. J. WHEELER (*Michigan Sta. Spec. Bul. 271 (1936), pp. 15, fig. 1*).—The characteristics; yields; soil, cultural, fertility, harvesting, storage, and insect and plant disease control requirements; and market value and culinary quality of the Katahdin potato (E. S. R., 73, p. 471; 74, p. 630) are described from various tests in Michigan, 1931–35. Special cultural recommendations based on this work are outlined.

Katahdin proved well adapted to most sections of Michigan, producing table stock of good market quality, and developing tubers of good type under hot, dry conditions which often prove unfavorable to Russet Rural. Katahdin responded favorably to early planting, irrigation, fertilization, and close spacing, often outyielding Russet Rural in tubers of good type. When planted in April or May for the August and September market it generally surpassed Irish Cobbler in yield of marketable potatoes.

Katahdin is described as resistant to mild mosaic, but susceptible to leaf roll, spindle tuber, and other diseases commonly found in Michigan potatoes. It is more susceptible to scab than Russet Rural and is often injured more than the Rural varieties by leafhoppers and flea beetles.

Toxicity from arsenic compounds to rice on flooded soils, J. F. REED and M. B. STURGIS (*Jour. Amer. Soc. Agron., 28 (1936), No. 6, pp. 432–436*).—The effect on the yield of rice of applications of varying amounts of calcium arsenate on different soil types was studied at the Louisiana Experiment Station, where it was found that the toxic effect was governed largely by the soil type. On the lighter soils rice was seriously affected by 50 lb. per acre of calcium arsenate, while on the heavier soils 150 lb. was not injurious. No correlation

was found between water-soluble arsenic and toxicity, though a relationship existed between 0.05N HCl-soluble arsenic and toxicity. Less total arsenic was found in the soil at the conclusion of the test than was present at the beginning. From an analysis of the rice panicles and straw, the loss could not be attributed to crop removal. Since the soil was in a highly reducing condition when flooded under cultivation, the loss in arsenic content might be accounted for by complete reduction to gaseous arsine. Furthermore, indications were that it is the reduced arsenic compounds, arsenites, etc., that are particularly toxic to rice under flooded conditions.

Relation of phosphorus to growth, nodulation, and composition of soybeans, T. B. HUTCHINGS (*Missouri Sta. Res. Bul. 243 (1936), pp. 46, figs. 20*).—The influence of phosphorus on the growth, nodulation, and composition of Virginia soybeans was studied by using colloidal clay, employed earlier by Albrecht (E. S. R., 70, p. 174) and Horner (E. S. R., 75, p. 42), as a carrier for this anion together with cations as plant nutrients.

Phosphorus did not appear to be a significant factor in controlling nodulation in the early activity of the plant. As indicated by growth and plant composition, seed phosphorus and applied phosphorus were used most efficiently in the early growth period when the calcium needs of the plants were satisfied. When plenty of calcium was supplied the crop contained more of the other nutrients as well as of the calcium as a result of increased production and usually as a consequence of an actual tissue enrichment as measured by percentage. The phosphorus and nitrogen content of the plant material were closely related. No mathematically specific ratio was found for calcium and phosphorus, although it was suggested. A relatively close interrelationship of calcium-phosphorus-nitrogen and their importance in the successful growing of soybeans and possibly other legumes was evident. As measured by consecutive crop production, phosphorus additions represented a higher level of fertility.

The colloidal fraction of the Putnam silt loam was shown to adsorb phosphorus, this adsorption being influenced by adsorbed calcium. The phosphorus so adsorbed is released readily by electrodialysis and is available for plants on the basis of such a measure.

Kingwa soybeans, R. J. GARBER (*West Virginia Sta. Bul. 273 (1936), pp. 4; also in Jour. Amer. Soc. Agron., 28 (1936), No. 6, pp. 457–459*).—Because of similarity in origin, yields, and other agronomic characters, and the currently much wider distribution and commercial establishment of Kingwa soybeans, it is proposed that Pekwa soybeans (E. S. R., 66, p. 735), also a pure line selection made at the station from the Peking variety, be renamed Kingwa.

Effect of tillers on the development of grain sorghums, A. T. BARTEL, J. H. MARTIN, and R. S. HAWKINS (*Jour. Amer. Soc. Agron., 27 (1935), No. 9, pp. 707–714, figs. 4*).—Tillers and leaves of the main stalks of Dwarf hegari were removed at several developmental stages in a cooperative study by the Arizona Experiment Station and the U. S. D. A. Bureau of Plant Industry.

The tillers increased the development of the main stalks when main stalk leaves were removed before heading, and the weights of the main stalk increased the longer the tillers were left on the plant. When the main stalk was defoliated at the soft dough stage of the kernels or when the main stalk leaves were allowed to remain, the weights of the main stalk decreased the longer the tillers were left on the plants. Tillers in such cases seemed detrimental to main stalk development, although they produced more than enough grain and stover to offset decreased growth of the main stalk. Evidently plant juices are free to move from the main stalk to the tillers, or the reverse, depending upon when the nutritional deficiency occurs. A vascular connection between the main stalk

and tillers is illustrated. The effects of the tillers on the main stalks of plants subjected to drought were about the same as plants receiving ordinary irrigation.

Longevity and viability of sorghum seed, R. E. KARPER and D. L. JONES (*Jour. Amer. Soc. Agron., 28 (1936), No. 4, pp. 330, 331, fig. 1*).—Additional germination tests (E. S. R., 59, p. 629) by the Texas Experiment Station on seed stored under rather dry conditions at Lubbock showed the germination percentage of Blackhull kafir to be in 1917, 100; 1924, 88; 1926, 79.5; 1927, 65; 1929, 48; 1931, 34.2; 1933, 15.5; 1935, 4; and 1936, 0.5. Decline in vigor of germination compared with fresh seed was evident in tests after 1931.

Cane growth studies: The dominating effect of climate, R. J. BORDEN (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 40 (1936), No. 2, pp. 143–156, figs. 5*).—In a 14-mo. study supplementing that of Das (E. S. R., 73, p. 40), the H 109, Striped Tip, and P. O. J. 2878 sugarcane varieties were grown at Makiki (40-ft. elevation) and Manoa (550 ft.) on both the yellowish brown silty loam of Manoa and the finer chocolate brown loam of Makiki under several fertilizer treatments.

Under the more favorable Makiki climate more than three times as much sugar was produced as at Manoa. H 109 took best advantage of the favorable Makiki conditions, while Striped Tip did best at Manoa. Relatively 19 percent more phosphate and 50 percent more potash were found per unit of juice in the cane grown at Manoa. The soils of the series grown at Manoa became generally more acid than the Makiki series while the crops were growing in them. The relative cane yields from the Manoa soil averaged 24 percent more than the Makiki soil, being 40 percent higher at Makiki and only 8 percent over the Makiki soil at Manoa. The Manoa soil also netted considerably more sugar when the cane was grown thereon at Makiki. H 109 was superior to P. O. J. 2878 and Striped Tip at both Makiki and Manoa, and yet it apparently was a more economical user of both phosphate and potash. P. O. J. 2878 surpassed Striped Tip at Makiki, but the reverse occurred at Manoa. P. O. J. 2878 took up less phosphate but more potash than Striped Tip. P. O. J. 2878 when amply supplied with fertilizer on either soil type gained in yield of cane and sugar over the inadequately fertilized series, such gains being much greater at Makiki. The heavier fertilization affected adversely the quality of P. O. J. 2878 grown at Manoa but not at Makiki.

Sugar cane variety report, season of 1935, C. B. GOUAUX and E. C. SIMON (*Louisiana Sta. Bul. 274 (1936), pp. 26*).—The tabulated results of continued varietal comparisons (E. S. R., 71, p. 628) in 10 localities in the sugarcane belt, reported by Gouaux, show the cane yields and sucrose content (and for 1 field, sirup production), relative values per ton and acre for plant cane and first and second stubbles of a number of sugarcane varieties grown on Yazoo sandy soil, Yahola very fine sandy loam, Iberia clay loam, Sharkey loam, and Lintonia and Olivier silt loams. Results of fall plant cane and first stubble tests of all test fields indicate that C. P. 28–19 had given the highest sucrose tests, with C. P. 29–320, P. O. J. 234, Co. 281, and C. P. 28–11 following in order. The recently released C. P. 28–11, C. P. 28–19, and C. P. 29–320 varieties mature early and under favorable conditions can produce good field yields as plant cane and stubble. C. P. 28–19 and C. P. 29–320 are good land canes, and C. P. 28–11 is well suited to black lands. C. P. 28–11 is very susceptible to cane borers and windstorm damages, but resists stubble deterioration, red rot, and mosaic diseases, and can replace C. P. 807 on the heavier poorly drained soils. On very fertile soils C. P. 28–19 will lodge, while C. P. 29–320 is very erect growing and not subject to lodging. Both C. P. 28–19 and C. P. 29–320, like Co. 281, respond well to good cultivation. Certain features of Co. 281 and 290 also are discussed.

In tests at the sugar experiment station, reported by Simon, fiber contents ranged from 10 percent for Co. 290 to 15 for C. P. 28–11. Maturity studies continued to show that C. P. 28–19 and C. P. 29–320 are very early maturing canes. At Baton Rouge, C. P. 29–320 consistently matured much earlier than P. O. J. 234, while C. P. 28–19 was as early. In the 1935 series, both C. P. 28–19 and C. P. 29–320 were earlier in maturity and their juices contained higher sucrose than P. O. J. 234. Co. 281 again showed itself to be somewhat late in maturity. In a comparison of commercial varieties, P. O. J. 234 was definitely inferior to the newer commercial varieties. The sugar-per-acre yields of second-year stubbles of Co. 281, C. P. 28–11, C. P. 28–19, and Co. 290 were greater than from plant cane of P. O. J. 234. The excellent stubbling qualities of the newer varieties were quite evident. Findings in a windrowing experiment in which Co. 281, the standard windrowing variety, was outstanding, confirmed previous work to the effect that sufficient acreage of sugarcane which will stand windrowing must be grown if the grinding season is to be prolonged with safety after December 20.

A field aspirator for emasculating sweet clover flowers, D. A. SAVAGE (*Jour. Amer. Soc. Agron., 27 (1935), No. 9, pp. 774, 775, fig. 1*).—Although the method by Kirk (E. S. R., 62, p. 513) for emasculating sweetclover flowers was used successfully in the greenhouse at the Fort Hays, Kans., Substation, it is not considered suited for field use where water is not available. Therefore, the simple and efficient aspirator described, which provides suction without the use of water, was developed. Satisfactory results were obtained also from its use in breeding alfalfa.

Sweet potato varieties and cultural practices, compiled by C. F. CLARK (*Mississippi Sta. Bul. 313 (1936), pp. 27*).—The information presented on the yields, characteristics, and storage behavior of sweetpotato varieties; consumer preferences; bedding; home-grown v. shipped-in plants; northern- v. southern-grown seed; comparative yields of vines, draws, and whole roots; seedbed preparation; time of planting; spacing; use of vines and vine parts as plants; and effect of cutting off vines on yields was compiled from reports of experiments and studies made by State experiment stations and the U. S. Department of Agriculture.

Studies on Hessian fly infestation and some characters of the wheat culm, D. C. ANDERSON and H. M. BROWN (*Jour. Amer. Soc. Agron., 28 (1936), No. 6, pp. 479–483, fig. 1*).—Strain determinations on percentage of Hessian fly infestation and field lodging, and culm determinations on breaking strength, weight, and diameter were made at the Michigan Experiment Station on 111 strains of soft winter wheat in 1932 and 112 strains in 1933.

Significant interstrain differences were noted in fly infestation, breaking strength, weight of culm, and diameter of culm, and these differences, according to interannual correlations, tended to persist from year to year. There were significant differences in breaking strength, weight, and diameter of culm between the puparia-free and puparia-infested groups within the same strain, but the very low nonsignificant coefficients of correlation between fly infestation and breaking strength, weight, and diameter of culm indicate that selection for fly resistance by using one of these morphological factors would be ineffective. Hessian fly infestation and field lodging were associated significantly and positively.

Canawa—a new variety of soft red winter wheat, R. J. GARBER and L. S. BENNETT (*West Virginia Sta. Bul. 272 (1936), pp. 8, fig. 1*).—Originated from a single head selected from a mixed variety grown at the station in 1921 under the name of Canada Hybrid, Canawa is a smooth, soft red winter wheat with

medium-sized spikes that droop when the grain is ripe and with purplish, stiff straw showing little tendency to lodge. The kernels are relatively hard for a wheat belonging to the soft red winter class. Experimental tests show the yielding ability of Canawa to equal that of Fulhio, a productive wheat under West Virginia conditions. In cooperative tests with farmers, Canawa produced significantly greater average yields than did the wheat now commonly grown.

Tes s made by the Grain Division of the U. S. D. A. Bureau of Agricultural Economics indicated that Canawa has satisfactory milling qualities, and that while flour from Canawa probably is more suitable for pastries and biscuits, it may be expected to give satisfactory results when used for bread, particularly if blended with stronger flours.

Varietal composition of Canadian hard red spring wheat, J. G. C. FRASER and A. G. O. WHITESIDE (*Sci. Agr., 16 (1936), No. 8, pp. 409–423, figs. 4; Fr. abs., p. 423*).—Varietal analyses of the minimum Standard and Export Standard samples of the Western Grain Inspection Division, Winnipeg, covering 1926 to 1934, and of samples from cargo shipments from 1928 to 1934, inclusive, showed Marquis to be the predominating variety found in contract grades Manitoba 1, 2, and 3 Northern, the only grades considered. After 1929, varieties classed as fair to poor quality wheats decreased rapidly. The varietal analyses for the cargo shipments did not agree with the varietal analyses for the standards, especially for the Manitoba 2 and 3 Northern grades. This is explained chiefly by the fact that Standard samples are made up early in the crop year, while cargo samples were secured over a longer period and therefore included more wheat grown in the northern districts where Garnet is the chief variety. Protein determinations made on the cargo samples for 1932–34 indicated that the Atlantic and Pacific shipments for the Manitoba 1 Northern grade averaged about the same, although considerable variation occurred between different cargo samples. For the Manitoba 2 and 3 Northern grades the Pacific shipments averaged substantially below the Atlantic samples.

The wheat meal fermentation time test for measuring quality in wheat, G. H. CUTLER and W. W. WORZELLA (*Indiana Sta. Circ. 218 (1936), pp. 14, figs. 11*).—In the wheat meal fermentation test a given quantity of whole wheat meal is mixed with a definite amount of yeast suspension and made into a doughball. The latter is then placed in a beaker, containing distilled water, which is put into an oven in which the temperature is favorable for yeast fermentation, gas evolution, and disintegration of the dough mass. The length of time or fermentation time required to start the disintegration of the doughball is used as an index or measure of the gluten strength of flour which may be derived from a given sample of wheat. The method is described in detail and essential features are illustrated, with remarks on i's limitations and interpretations and on the need for milling and baking tests in addition for the securing of complete data on quality. A classification of wheats based on utility and quality is suggested.

Yams for Hawaiian gardens, E. L. CAUM and J. P. MARTIN (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 40 (1936), No. 2, pp. 171–182, figs. 16*).—The behavior of the Spiny or Lesser yam, *Dioscorea esculenta*, in tests in Hawaii is described and illustrated, with notes on other yams found in Honolulu markets.

Length of the dormant period in cereal seeds, A. H. LARSON, R. B. HARVEY, and J. LARSON (*Jour. Agr. Res. [U. S.], 52 (1936), No. 11, pp. 811–836*).—When the length of the rest period of a number of common varieties of wheat, oats, barley, and rye was determined by germination tests at the Minnesota Experi-

ment Station, made on material collected at the soft dough, hard dough, and ripe stages of maturity, the rest period was found to be longest in immature seeds. Lowering the temperature at which the seed was stored generally prolonged the rest period. The length of the rest period was found to vary greatly with the variety. In general, winter wheats had a shorter rest period than spring wheats. In oats, a rest period of any considerable length was found only in the late varieties.

An interesting seed combination, T. R. STANTON and E. G. BOERNER (*Jour. Amer. Soc. Agron., 28 (1936), No. 4, pp. 329, 330, fig. 1*).—Oats having seed of Napa thistle (or any other noxious weed) lodged on the palea behind the folds of the lemma of primary grains, as in the material described, evidently should not be used for seed, since such weed seeds cannot be removed mechanically.

Effectiveness of furfural petroleum combinations in eradicating certain noxious weeds, H. L. BUCKARDT (*Jour. Amer. Soc. Agron., 28 (1936), No. 6, pp. 437–442, fig. 1*).—About 70 percent of the dandelion plants growing on plats where the grass was kept cut short were killed by one application of 4 cc of the best furfural petroleum materials in a study at the Illinois Experiment Station. More material was required to kill large mature plants than small plants. Some plants killed 3 in. below the crown produced new growth, appearing above ground 42 days after treatment.

Kills of 100 percent were obtained when broadleaved or buckhorn plantain plants were treated with 4 cc of the best materials. One application of 250, 500, or 750 gal. per acre of any of the materials did not kill all the roots of either quackgrass or field bindweed, nor did a second application on the same plats with the same quantity as applied the first time give complete eradication. Late June and July treatments gave a higher percentage of kill than late August and September treatments, moisture being one of the most important factors. The resulting percentage of kill was not related to the time of day when application was made. When added to petroleum oils, furfural increased their toxicity, causing them to kill with greater rapidity. The lighter grade petroleum oils were in all cases more toxic than heavier grade oils.

Leafy spurge, Euphorbia esula L., A. L. BAKKE (*Iowa Sta. Res. Bul. 198 (1936), pp. 207–246, figs. 23*).—The characteristics, distribution, and taxonomic relationships of leafy spurge, its flowering and fruiting habits, pollination, seed studies, and certain characteristics of the root system, leaf, stem, and latex system are described from research in progress at the field weed laboratory, near Hawarden.

Leafy spurge is a perennial weed common in northwestern Iowa and in Delaware County in northeastern Iowa, where it causes serious damage to crops. It is also common in other countries. Heavy infestations also exist in eastern South Dakota, eastern North Dakota, and southwestern Minnesota. The leafy spurge occurring in Iowa is *E. esula* rather than *E. virgata*.

The fruit is a capsule containing three ovules and bursting on maturity, forcibly ejecting the seed, which scatter to some distance. The flowers are pollinated chiefly by insects, as the stamens mature after the pistil. The soldier beetle (*Chauliognathus pennsylvanicus* De Gur.) is commonly found upon the flowers.

Fully mature seeds are brown and are heavier and absorb water faster than the gray, immature seeds. The seeds float on water and germinate readily, best between 82° and 88° F., where imbibition is greatest. Germination did not occur between 34° and 37°. Seeds placed in solutions of calcium salts absorbed more water than those in solutions of sodium salts. Seeds placed in solutions of sodium chlorate (0.10 M) failed to germinate. Those taken from plants

sprayed with sodium chlorate 1 lb. to a gallon of water and then dried produced a germination of 3 percent. While *E. esula* seeds are found in large numbers in the digestive tracts of mourning doves of the region, no whole or viable seeds were found in the intestines, indicating that this bird is not an agent in distributing the weed.

The root system of leafy spurge may penetrate vertically more than 15 ft. Shoot buds were found to a depth of 10 ft. It is assumed that the age of a plant may be determined by the rings of differential growth in the roots. Leafy spurge has an extensive food storage system in the roots. Roots taken from plants sprayed with sodium chlorate and from plants on fallowed areas showed a small amount of food storage.

The leaves of leafy spurge possess typical xerophytic characters, the stomata are sunken into pits or cavities, and there are two layers of palisade parenchyma cells. The plant is provided with a well-developed latex system.

Quack grass control, C. R. MEGEE (*Michigan Sta. Quart. Bul., 18 (1936), No. 4, pp. 219–223*).—Practical information is given on the control of quackgrass in infested fields by double plowing, summer fallow, summer plowing, and by special quackgrass cultivators and control of patches by spraying or dusting with chlorates.

HORTICULTURE

[Horticultural studies by the Alaska Station] (*Alaska Col. Sta. Bul. 4 [1935], pp. 11, 12, 14, 15, 46–48, figs. 2*).—Brief reports are presented on the results of cultural experiments with blueberries, currants, and raspberries; on variety and breeding trials with garden peas; and on tests at the Matanuska Substation of various small fruits, crab apples, rhubarb, horseradish, and ornamentals.

[Horticultural studies by the Indiana Station] (*Indiana Sta. Rpt. 1935, pp. 44–47, 48–50, 55, 57, 58, figs. 7*).—Included in this report are the results of studies of orchard soil management, apple pruning, spray materials, stationary v. portable sprayers, the removal of spray residues, apple storage, plum varieties, pyrethrum production, tomato seed production, factors influencing tomato and muskmelon quality, photoperiod and light intensity requirements of greenhouse plants, the marketing of vegetables and strawberries, seasonal changes in the composition of Stayman Winesap apple trees, the influence of spray schedules and washing treatments on residues, effect of cultural treatments on growth and reproduction of apple trees, varieties of pumpkins, and factors affecting the canning qualities of pumpkins.

[Horticultural work at the Moses Fell Annex Farm], H. J. REED and H. G. HALL (*Indiana Sta. Circ. 219 (1936), pp. 13–16, fig. 1*).—Brief comments are presented on the results of variety tests with plums, control of codling moth, removal of spray residues from apples, comparative costs of stationary and portable spraying, and the storage of apples.

[Horticultural studies by the Puerto Rico Station] (*Puerto Rico Sta. Rpt. 1935, pp. 13–23, 27–29, figs. 7*).—Among studies the progress of which is discussed are the breeding of sweet corn adapted to tropical conditions; the transportation of sweet corn to New York City; culture, improvement, and utilization of bamboo; effect of shading on coffee; comparative yields of Columnaris and Puerto Rican varieties of Arabian coffee; resistance of the Columnaris coffee to root rot (*Rosellinia bunodes*); and culture of the mangosteen, palm chestnut, *Uvaria lancifolia*, and of the wax flower (*Phaeomeria speciosa*).

[Horticultural studies by the Rhode Island Station] (*Rhode Island Sta. Rpt. [1935], pp. 9–12, 16–18, 20–23, 24, 25*).—Included are brief comments on the progress of experiments in the fertilizer requirements of vegetables; strain and

variety tests of vegetables; breeding of blackberries; fertilizer needs of raspberries and grapes; variety tests of drupe fruits, with special reference to brown rot resistance in plums; value of Burgundy mixture for the control of brown rot; winter forcing of gladioluses, rhododendrons, azaleas, and other ornamentals; optimum levels of soil nitrates in the growth of carrots; fertilizers for *Daphne cneorum* and *Sciodopitys verticillata;* the response of *D. cneorum* to different soils; and the effect of day length on the nitrogen requirements of beets.

[Horticultural studies by the Tennessee Station], B. D. DRAIN and B. P. HAZLEWOOD (*Tennessee Sta. Rpt. 1934, pp. 27, 28, 29, 32, 33, 37, 38*).—Among studies discussed are the breeding of red raspberries and strawberries; testing of strawberry varieties; comparison of mazzard and mahaleb rootstocks; value of the Methley plum, improvement of pyrethrum, testing of varieties of sweet corn, and tests of ornamentals.

Work at the Mericourt Substation included tests of new strains of pyrethrum, culture of red raspberries, value of calcium cyanamide for asparagus, and the response of crapemyrtle and mountain-laurel to lime.

At the West Tennessee Substation there were conducted variety tests with vegetables and various fruits.

Delta home vegetable gardens, E. A. CURREY (*Mississippi Sta. Bul. 311 (1936), pp. 22, figs. 12*).—General information is presented on cultural requirements, comparative yields, control of various insect and fungus pests, etc.

The influence of acid-neutral fertilizers on vegetable crop production in eastern Virginia, J. B. HESTER and F. A. SHELTON (*Virginia Truck Sta. Bul. 90 (1936), pp. 1289–1301, figs. 5*).—In pot experiments in which sorghum, spinach, and collards were grown on a Sassafras loam soil fertilized with acid- and nonacid-forming materials, it was observed that the soil reaction in the fertilizer zone may be materially influenced by the type of material applied. Dolomitic limestones of 80- to 100-mesh fineness were found capable of approximately maintaining the soil reaction against changes due to acid-forming salts, such as sulfate of ammonia. Nonacid-forming fertilizer greatly increased the yield of soil acid sensitive crops. The authors point out that limestone in the fertilizer does not replace lime applied to correct soil reaction but does tend to reduce the frequency with which subsequent applications may be required. Certain soils may actually benefit from the application of acid fertilizers.

Magnesium deficiency.—I, The value of magnesium compounds in vegetable production in Virginia, R. L. CAROLUS and B. E. BROWN (*Virginia Truck Sta. Bul. 89 (1935), pp. 1247–1288, figs. 11*).—Discussing the role of magnesium in the development of chlorophyll, the natural distribution of magnesium in the soil, and reasons for its deficiency in eastern Virginia, the authors report the results of 5 years' studies with most of the important truck crops to determine their response to magnesium and the best sources and methods of applying the element to the soil. It was found that rapidly growing crops, such as potatoes, cabbage, spinach, cucumbers, and corn, have a definite period in their growth during which their magnesium need is very high, and if not available the results are yellowing of the lower leaves. On the basis of 13 farms, potato yields were increased 6.8 bbl. per acre on the average by the inclusion of magnesium in the fertilizer. Dolomitic limestone fine enough so that 80 percent could pass a 100-mesh sieve was also a satisfactory source of magnesium for carrots, beets, sorghum, beans, peas, onions, eggplants, spinach, turnips, and radishes. With cabbage the inclusion of 1 percent of some soluble source of magnesia along with the dolomitic limestone was found desirable. In addition to increasing the yields the magnesium increased the proportion of heads that could be cut at the first harvest. Soluble magnesium was also beneficial

in the case of peppers, cucumbers, tomatoes, and corn. In no case was magnesium in either soluble or insoluble form harmful to the crops. Limes containing from 10 to 37 percent of magnesium oxide are available in Virginia and are recommended for use. Calcined kieserite and sulfate of potash magnesia are suggested as soluble materials when a large magnesium deficiency exists. The regular use of green manures and the judicious use of dolomitic limestone are believed the most feasible measures for preventing magnesium deficiency.

The production of cucumbers for pickling purposes, H. L. SEATON, R. HUTSON, and J. H. MUNCIE (*Michigan Sta. Spec. Bul. 273 (1936), pp. 40, figs. 14*).—Based largely on experimental results and on extensive field surveys in the producing areas, information is presented on the climatic, soil, and cultural requirements and on the control of insect and fungus pests. In general heavy clays and poor sands were not found suitable for cucumber production, fertile sandy loams underlaid with clay subsoil being ideal. On almost all soils stable manures were decidedly profitable, and if unavailable must be substituted by soiling crops. As to the time of planting, the best stands and the largest yields were secured at East Lansing when the seeds were sown about 4 weeks after the average date of the last killing frost, somewhere between June 1 and 10. The desirability of planting in full sunlight was shown in an experiment at East Lansing where interplanting with sweet corn reduced yields and returns. The importance of adequate pollination was shown in cage experiments in which plants caged without insects were highly unproductive as compared with open-pollinated plants. The percentages of straight fruits were much higher in the open.

A summary of cultural recommendations is presented for the benefit of growers.

Growing peas for canning in Washington, C. L. VINCENT (*Washington Sta. Pop. Bul. 150 (1936), pp. 28, figs. 10*).—In this general discussion there is presented information relative to the present status of pea canning in the State, climatic and soil requirements, fertilization, culture, varieties, harvesting, utilization, and control of diseases and insects.

Some factors which influence the germination of pepper seeds, H. L. COCHRAN (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 477–480*).—Of several factors studied at Cornell University as to their effects on the germination of pepper seeds, temperature was found to have the most profound influence. The number of days required from planting until the first seedlings appeared decreased rapidly as the temperature was raised from 50°–60° to 90°–100° F. At 40°–50° no germination occurred in 45 days, but upon shifting the seed to 90°–100° rapid germination followed. Soaking the seeds in tap water at 71° prior to planting had no significant effect on the speed of germination and subirrigating the seed boxes actually reduced the percentage of germination at all temperatures, apparently due to the cooling of the soil.

The culture of table stock rutabagas in the Upper Peninsula of Michigan, B. R. CHURCHILL (*Michigan Sta. Quart. Bul., 18 (1936), No. 4, pp. 259–262, fig. 1*).—In a test at the Upper Peninsula Experiment Station at Chatham of 11 varieties of rutabagas, the Perfect Model variety was most productive, with a total yield of nearly 18 tons per acre. Cultural tests indicated the desirability of preparing a thoroughly pulverized seedbed and firming the soil either immediately before or after planting. Rows 30 in. apart and plants 10 in. apart in the row are recommended. Under the conditions, planting on or before June 15 was found desirable.

Variations in fleshiness of tomato fruits as affected by fertilization, K. K. KRAUSCHE and B. E. GILBERT (*Plant Physiol., 11 (1936), No. 3, pp. 641–645, figs. 2*).—Studies by the Rhode Island Experiment Station on fruits of Pritchard

tomatoes grown under differential fertilizer treatments indicated that high nitrogen tends toward fruits with relatively less flesh than that of low-nitrogen plants. The use of excessive amounts of nitrogen in the fertilizer may thus produce fruits with such large cavities as to reduce quality. However, since the flesh of the low-nitrogen fruits tended to be less firm, the authors suggest that a medium nitrogen fertilization treatment should be most desirable.

A new method of growing seedlings [trans. title], R. VON VEH (*Züchter, 8 (1936), No. 6, pp. 145–151, figs. 11*).—A method of germinating freshly harvested apple, pear, and quince seeds is described in which the seeds after 1 or 2 days' immersion in tap water are divested of their outer seed coats and the embryos germinated in petri dishes held at room temperature. A layer of ground cork floating on water was found a desirable medium upon which to place the embryos. After 10–14 days the seedlings were transferred to a mixture of one-half peat and one-half sand. In early spring the young plants were moved to an outdoor bed and exposed to frost. When returned to the greenhouse, rapid development ensued. With this technic plants were developed in 8 mo. to a size reached ordinarily in 20 mo.

Pollination studies with Golden Delicious, Minkler, and Arkansas varieties of apples, A. E. MURNEEK (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 1–3*).—In these studies, conducted by the Missouri Experiment Station, it was found that Golden Delicious is an effective pollinizer for Grimes Golden, Delicious, Stayman, and Winesap, and it is included with Delicious, Jonathan, and Ben Davis as the four varieties suitable for pollinizing orchards in the Central States. In crossing Minkler and Arkansas with several varieties it was evident that Grimes Golden is a poor pollinizer for both, yielding no fruit in the case of Arkansas. Cross-incompatibility was thus indicated in the Arkansas Grimes Golden combination.

Notes on pollination of Northern Spy, L. JOLEY (*Michigan Sta. Quart. Bul., 18 (1936), No. 4, pp. 240–242*).—Stating that the late-blooming habit of Northern Spy presents a pollination problem in certain orchards, the author tested Northwestern Greening, Mother, and Red Canada pollens and obtained good sets of fruit in all cases. Since Northwestern Greening is a poor pollen producer, its practical value as a pollinizer for Northern Spy is questioned. Phenological observations in the spring of 1935 showed that when half of the Northern Spy blooms were open 77 percent of McIntosh blooms had dropped their petals and 89 percent of the anthers had dehisced. Mother, Northwestern Greening, and Tolman Sweet apparently overlapped Northern Spy very well. Williams, found in other experiments to produce abundant pollen and to pollinate Northern Spy effectively, and Mother are suggested for planting with Northern Spy.

Pre-harvest spraying of apples for removal of lead residues, H. N. WORTHLEY and D. E. H. FREAR (*Jour. Econ. Ent., 29 (1936), No. 3, pp. 524–526*).—Three materials, hydrated lime 10 lb. per 100 gal. of water, ammonium nitrate 8 lb. per 100 gal. water, and paste Vatsol 0.5 lb. per 100 gal. of water, were applied by the Pennsylvania Experiment Station on September 15 to 18-year-old Stayman Winesap and York Imperial trees to test their value in facilitating the removal of residues. In only one instance, that of Stayman Winesap sprayed with lead arsenate plus mineral oil emulsion, did any of the materials appear to increase the loss of lead to a significant degree. Vatsol showed considerable benefit in this single test, although the residues at harvest were far above the legal tolerances. With the possible exception of lime, the supplementary sprays exerted little beneficial effect on the removal of residues by hydrochloric acid solution in a flotation washer. Since it was necessary to wash all the fruit

with hydrochloric acid, none of the treatments are considered practical except possibly for orchards where the fruit exceeds the tolerance by slight margins.

The removal of fluorine spray residue from apples sprayed with natural cryolite, K. GROVES, R. E. MARSHALL, F. L. OVERLEY, and J. L. ST. JOHN (*Washington Sta. Bul. 329 (1936), pp. 15*).—Stating that large amounts of fluorine compounds are now used in Washington apple orchards but that their use has been limited by difficulties in residue removal, the authors discuss the results of washing experiments with apples sprayed according to prescribed schedules and for the most part cleansed with the experimental machine developed by the college. Of 322 fluorine determinations, 178 were the results of three washes of five different samples. In one test in which samples in the same lot of sprayed fruit were washed on 7 different days and a total of 17 analyses were made, there was an average of 0.014 grain of fluorine per pound of fruit. The minimum was 0 008 and the maximum 0.025 grain per pound. Thus an average residue below the tolerance did not necessarily mean satisfactory cleansing.

A number of trials were conducted with aluminum chloride as one solution in a tandem with sodium silicate. The results were unsatisfactory, as the aluminum chloride apparently formed a gummy deposit on the surface of the apple wax and this deposit was not completely removed in the water rinse. There was no noticeable improvement when 1 percent of mineral oil was added. Minor variations in the washing procedure, such as the use of brushes or rollers, changes in the sequence of the washes, or the addition of oil to the acid or to the sodium silicate, did not alter materially the results. Tandem washes with hydrochloric acid and oil as the first wash were not effective. Without the oil the data showed no advantage for either sequence for the hydrochloric acid. Apples washed in solutions containing mineral oil lost moisture and shriveled more rapidly in storage than those washed without oil. The authors point out that with one exception the spray programs followed were severe from the residue removal standpoint, yet in general they conclude that too much confidence should not be placed on one season's results.

The Old Home pear as a pollinizer for standard varieties, S. JOHNSTON (*Michigan Sta. Quart. Bul., 18 (1936), No. 4, pp. 218, 219*).—In tests conducted at South Haven and East Lansing satisfactory sets of Bartlett, Beurre Bosc, Seckel, Clapp Favorite, Howell, Kieffer, and Flemish Beauty were secured with Old Home as the pollen parent.

Factors influencing the yields of Montmorency cherry orchards in Michigan, V. R. GARDNER (*Michigan Sta. Spec. Bul. 275 (1936), pp. 18, figs. 4*).—Records taken in Michigan orchards distributed over a wide area and on different types of soil indicated that Montmorency cherries generally reached their peak of production when about 21 yr. of age, but that high production may be maintained over several years. On good soil and with good care Montmorency trees should remain profitable for many years. A study of trunk circumference measurements in a random sample of 44 representative Montmorency orchards indicated that the trees on the average had attained only three-fourths the size that would be possible if they had all been located on first-grade soil. A very close correlation was shown between growth and yield, indicating that yields were correspondingly decreased on the poorer soils.

Climatic influences were observed to vary with the site. Yield records on a random sample of 422 orchards covering periods of from 3 to 9 yr. in each orchard showed that on the average one crop out of three is lost because of spring frosts. On the other hand, on the third of the orchards located on the better sites crop losses from frosts occur less frequently than once in 5 yr. Fruit setting records

taken at South Haven and Grand Rapids showed considerable variation in any one orchard from year to year and between orchards in any one year. The population of available bees is believed to be an important consideration in setting.

From an economic standpoint the author concludes that, on the basis of prices that have prevailed during recent years and general production, substantial profits from the growing of Montmorency cherries may be realized only when the yields are maintained well above the general average of 50 lb. of cherries per tree per year.

Approximate germination test for non-afterripened peach seed, H. B. TUKEY and M. S. BARRETT (*Plant Physiol., 11 (1936), No. 3, pp. 629–633, fig. 1*).—Peach pits obtained from a wide variation of sources were tested in autumn by the artificial culture of the naked embryo on various agars in search of a rapid method of determining in advance of sowing a knowledge of the potential germination. For comparison similar lots of pits were cracked and the seeds placed intact in moist peat moss at 5° C: Still other lots were handled according to the customary nursery planting practices. In general, the percentage of seeds germinating in the embryo culture trials checked rather closely with the afterripening method and also with the results secured following the commercial nursery practice. The author believes that the embryo cultural method may have possibilities as a rapid test for germinability of peach pits. The inclusion of glucose or sucrose in the agar media appeared to exert an inhibiting effect on the growth of the cultured embryos, and in general the absence of nutrients is considered an advantage because of a reduction in contaminating organisms.

Some studies of the degree of maturity of peaches at harvest in relation to flesh firmness, keeping quality, and edible texture, M. A. BLAKE and O. W. DAVIDSON (*New Jersey Stas. Bul. 606 (1936), pp. 35, figs. 5*).—An examination of Elberta peaches harvested at different stages of maturity from trees in high carbohydrate, medium-high carbohydrate, and a high nitrogen growth status showed that fruits from the high and medium-high carbohydrate trees contained from 30 to 75 percent more reducing sugars than did the fruits from the high-nitrogen trees. Sucrose concentrations were higher and acid concentrations lower in both carbohydrate groups than in the high-nitrogen group. However, when the fruits were picked in the soft-ripe stage the differences in sucrose and acid concentrations were practically insignificant, except in the case of green fruits taken from the interior of the high-nitrogen trees. These green peaches were consistently lower in sugars and higher in acids than any of the other fruits under study.

Storage investigations showed important losses in weight during storage both by evaporation and respiration in fruit held at room temperatures. Since peaches contain only very small amounts of reserves from which sugars and acids may be formed during storage, there was no improvement in quality after picking. The comparative shipping or keeping qualities of peaches of different varieties or of peaches grown under different nutrient or environmental treatments could be determined only by a series of pressure tests adequate to measure the rate of softening of the flesh. Elberta peaches 10 cc of the juice of which required more than 15 cc of 0.1 N alkali for neutralization, together with a total sugar concentration of less than 7 percent, are described as distinctly sour and immature in taste and flavor. Fruits from high-nitrogen and low-carbohydrate trees were deficient in red color and sugar, possessed maximum pubescence for the variety, ripened unevenly, and were high in acids and low in flavor.

Fiftieth anniversary of the Lausanne Viticultural Station, 1886–1936, E. CHUARD, F. PORCHET, and H. FAES (*Cinquantenaire de la station viticole de Lausanne, 1886–1936. Lausanne: Impr. Concorde, 1936, pp. 83, figs. 27*).—This

memorial treatise discusses the origin, personnel, and work in viticulture, wine manufacture, pomology, entomology, and plant pathology, and presents a complete bibliography of station contributions.

Behavior of citrus fruit under special respiratory conditions as an expedient index of vitality, E. M. HARVEY and G. L. RYGG (*Plant Physiol., 11 (1936), No. 3, pp. 647–651, figs 3*).—Utilizing jars equipped with mercury manometers, the pressure changes were measured for several different fruits and vegetables as respiration altered from approximately normal to the anaerobic type. The majority of the tests were run at 72° F., although other temperatures, such as 38°, 42°, 46°, and 56°, were employed. A temperature of 56° proved satisfactory except that the period of observation was almost double that at 72°. Fruit having an initial respiratory ratio of less than unity began to develop a negative pressure at once, but after the development of nearly anaerobic conditions the pressure rose. Fruit with an initial respiratory ratio considerably greater than unity began to develop positive pressure immediately. The results indicate that the method may have value as a simple and rapid test of maturity or vitality of fruits and vegetables.

An unusual citrus rootstock, F. F. HALMA (*Jour. Heredity, 27 (1936), No. 5, pp. 204, 205, fig. 1*).—In this brief note mention is made of a lemon orchard in California, the rootstocks of which were found also to be lemons. When propagated, the rootstocks bore very long fruits, none of which contained seeds.

FORESTRY

[Forestry studies by the Indiana Station] (*Indiana Sta. Rpt. 1935, pp. 40–42*).—Brief discussions are presented on wood lot management on the Pinney-Purdue Experiment Farm, windbreak plantings in Jasper County, the marketing of basket veneer and handle stock, and a survey of the timber resources and marketing practices in Dubois County.

Age-size relationships of Hearts Content, a virgin forest in northwestern Pennsylvania, H. F. MOREY (*Ecology, 17 (1936), No. 2, pp. 251–257*).—Determination of the ages, heights, and diameters at breast height of some 800 trees of leading species, such as hemlock, beech, white pine, red and white oaks, black and yellow birches, and red maple, showed a good correlation between age and diameter at breast height for the major species, but the dispersion of the data about the curved averages was too great to allow accurate estimation of age from diameter at breast height. Height correlation and low standard errors for the height-diameter at breast height curves permitted estimation of height from diameter at breast height with a fair degree of accuracy.

The zone of effective windbreak influence, D. DENUYL (*Jour. Forestry, 34 (1936), No. 7, pp. 689–695*).—Records taken by the Indiana Experiment Station on the windbreaking effects of different types of shelterbelts, (1) a single row of Norway spruce, (2) rows, one of Austrian pine and the other Norway spruce, (3) 4 rows of Norway spruce, and (4) a single row of green willow, showed that the effective zone of wind velocity reduction depends not only upon the type of windbreak and prevailing velocity of the wind but also upon the amount of protection required to meet a specific need. The angle with which the wind approaches the barrier is also an important factor in effectiveness. The higher the wind velocity above a certain point the less the percentage reduction at any given distance from the windbreak.

Preplanting treatment of black cherry seed, R. R. PATON (*Jour. Forestry, 34 (1936), No. 7, p. 730*).—From the results of a test of five methods, (1) fermenation followed by washing, (2) fermentation without washing, (3) addition of lye to the fermenting process, (4) mashing without fermentation or wash-

ing, and (5) no treatment, the author concludes that it is not necessary to treat black cherry seeds in any way unless early germination is desired, and then fermenting of the seed is helpful.

A note on germination methods for coniferous species, N. T. MIROV (*Jour. Forestry, 34 (1936), No. 7, pp. 719–723*).—Presenting data to show that the germination of several species of California conifers was increased materially by stratification of the seed at 40° F., the author points out the probability that many germination trials with forest seeds have given erroneous information because of the failure to recognize the natural requirements of the seeds.

Viability of conifer seed as affected by seed moisture content and kiln temperature, W. G. MORRIS (*Jour. Agr. Res. [U. S.], 52 (1936), No. 11, pp. 855–864, figs. 2*).—Using Douglas fir and ponderosa pine seeds extracted by air drying of the cones, it was found that dry Douglas fir seed, that is, containing 7 percent moisture, was not injured by heating for 3 hr. at 50° C., but when the moisture content was 30 percent there was a great loss in germination. At 60° dry seed germinated normally, whereas with 30 percent or more moisture 0.5 hr. at this temperature caused complete failure. Since freshly harvested cones contain much more than 30 percent moisture, it is suggested that heating may be harmful. Increments as little as 5° may, under certain conditions, decrease the germination of either Douglas fir or ponderosa pine seeds by more than 30 percent. In unventilated drying chambers the temperature at various points may differ by 5°.

Three factors, namely, temperature, seed moisture content, and duration of the heating period, are concerned in kiln drying. Unless the factors are approaching the critical point, a slight increase in any one may not be dangerous, but when cones are being dried near the critical heat point an increase in any one of the three factors without a corresponding decrease in another may be serious.

In conclusion the author points out that it is imperative that there should be a thorough circulation of drying air around every cone and advises that cones must be spread in a thin layer to expedite drying. Drying should begin at about 40° and be increased to approximately 55° if the seed moisture content has been reduced to 20 percent or less. Moisture contents should be determined and the temperatures regulated accordingly.

Stratification of white pine seed to speed germination of spring-sown seed, P. W. ROBBINS (*Michigan Sta. Quart. Bul., 18 (1936), No. 4, pp. 245, 246*).—White pine seeds, known to germinate slowly and irregularly when planted in the spring and to suffer severe depredation by mice when planted without protection in the autumn, were stratified in sand in a screened box fully exposed to the winter weather. This seed germinated from 1 to 2 weeks earlier than that held in sealed jars at temperatures of from 40° to 60° F. and compared very favorably with seed sown outdoors in the fall. Because of the cost of constructing mouse-proof frames the stratification method is deemed more desirable.

Some observations on the reaction of pine seedlings to shade, G. A. PEARSON (*Ecology, 17 (1936), No. 2, pp. 270–276, figs. 2*).—Observations in the nursery of the Fort Valley Experimental Forest, near Flagstaff, Ariz., on the growth of ponderosa pine under lath shades of different densities and also in full sunlight showed that direct insolation is most favorable to this species. All of the trees receiving only 10 percent of full sunlight died the first winter and all but two of the trees receiving 20 percent died during the 5-yr. period. Plats in the 50 percent light group made slightly less height growth and only

about half the diameter growth of those in full sunlight. Water was not a limiting factor and all the plats were weeded consistently.

Factors influencing the rate of growth of pine in Arkansas, L. M. TURNER (*Ecology, 17 (1936), No. 2, pp. 227–240*).—Studies by the University of Arkansas on 125 0.25-acre plats of *Pinus echinata* and *P. taeda*, located on 18 soil types or phases of these types, showed a rather high degree of correlation between the rate of height growth and the soil series type, particularly with regard to soils with little variation in topography. A higher degree of correlation was established between the rate of height growth and degree of slope of soil series. Sites affording the highest indices were those on soils that are immature, flat, of high silt or silty sand content, with permeable subsoil, and at least fair drainage, but with obviously adequate water supply. On the other hand, the poorer sites were those with a high degree of slope and hence excessive run-off, or extremely stony, gravelly, or sandy soils of moderate or steep slope. The results of the study are said to suggest the practicability of predicting the tree-growing potentialities of recognizable site complexes.

Red squirrel damage to pine and spruce plantations, A. C. HART (*Jour. Forestry, 34 (1936), No. 7, pp. 729, 730*).—Observations by the Connecticut State College in March 1936, following a winter of heavy and prolonged snow cover, showed much injury to the buds of various conifers from the feeding of red squirrels. Of eight species, namely, Norway, white, and red spruces; Japanese red, Japanese black, white, and Norway pines; and Douglas fir, the Norway and white spruces seemed particularly susceptible to attack. Norway pine when planted in pure stands surrounded by hardwoods was also damaged. White pine, Douglas fir, and the two Japanese pines were free from injury.

Effect of repeated ground fires upon stumpage returns in western white pine, E. F. RAPRAEGER (*Jour. Forestry, 34 (1936), No. 7, pp. 715–718*).—Studies in a plat near Orofino, Idaho, in which the trees averaged 141 yr. and had passed through at least 5 fires, showed 3 notable unfavorable results of the fires, (1) the creation of blank spaces where groups of trees were actually killed, (2) decay traceable to fire injuries, and (3) rough growth due to uneven stocking following the fires. The gross losses were large and pointed to the need of complete protection from the seedling stage to maturity.

Timber growing and logging practice in ponderosa pine in the Northwest, R. H. WEIDMAN (*U. S. Dept. Agr., Tech. Bul. 511 (1936), pp. 92, figs. 15*).—This, the last in a series of 12 papers covering the principal forest regions of the United States, presents as did the earlier ones (1) the measures needed to prevent timber-producing lands from becoming barren, and (2) the measures required to grow valuable timber species. Among subjects considered are slash disposal, fire protection, methods of cutting and logging, the grazing of cut-over lands, control of insects and diseases, erosion control, the conditions suitable for intensive forestry, the meaning of full productivity, growth per acre under intensive forestry, practicability of full timber crops, and plans of management for permanent timber production. Appended are Dunning's tree classification, the essential steps in piling and burning slash, and a summary of the proposed minimum and intensive measures.

Scribner volume tables for cut-over stands of ponderosa pine in Arizona, E. M. HORNIBROOK (*Jour. Agr. Res. [U. S.], 52 (1936), No. 12, pp. 961–974, figs. 10*).—Following the technic of Schumacher and Hall (E. S. R., 70, p. 634), Scribner board-foot volume tables are developed for 3-in. classes of ponderosa pine in cut-over stands on the Malpais soil type in Arizona. The tables are printed in both alinement-chart and tabular form. Comparison of the data for the three age classes indicates that the volume equation for the young "blackjacks"

gives a result not significantly different from that for intermediates, whereas the equation for the oldest "yellow pines" gives a result significantly different from that for the other two classes, separate or combined. It is stated that while the tables evolved will give results within the standard error only if applied to trees in stands similar to those studied, this limitation will cause little difficulty in their use on stands cut under present U. S. D. A. Forest Service practice.

Marketing timber for basket stock in Indiana, R. C. BRUNDAGE (*Indiana Sta. Bul. 408 (1936), pp. 30, figs. 19*).—A survey of the industry showed that over 12,000,000 bd.-ft. of timber were sold to the 10 basket manufacturers in Indiana in 1935. Of this amount approximately 86 percent was secured from southern Indiana. Over 90 percent of the basket stock was beech, cottonwood, elm, hard maple, sweet gum, sycamore, and tulip poplar. Sound logs 14 in. or more in diameter and with straight grain and a maximum amount of light-colored sapwood are preferred for basket stock. There were found three common practices in selling timber, as follows: (1) As standing timber at a lump sum, (2) at a definite price per 1,000 bd.-ft. log scale when cut, and (3) as logs direct to the basket manufacturers. About 30 percent of the total was sold on the lump sum basis. When all grades of timber were averaged, selling by log scale at the farm netted a higher stumpage return than the other two methods, but when only high quality timber or No. 1 logs were averaged, direct sales to the basket companies netted from $1 to $2 more stumpage return. Stumpage prices ranged from $4 to $7 higher in northern than in southern Indiana. Careful bucking of timber produced better grades of logs and blocks and netted greater stumpage returns.

DISEASES OF PLANTS

[Phytopathological studies reported at the convention of the Association of Southern Agricultural Workers, 1933–35] (*Assoc. South. Agr. Workers Proc., 34 (1933), pp. 79, 80; 35 (1934), pp. 232, 310–312, 315, 316, 320, 321, 329–345; 36 (1935), pp. 569–579, 580, 581, 582, 583, 584–591*).—Abstracts of the following papers are included: Persistent Strands of the Cotton Root-Rot Fungus [*Phymatotrichum omnivorum*] in Texas, by H. C. McNamara (pp. 79, 80); Breeding Wilt Resistant Varieties of Cotton, by J. O. Ware and V. H. Young (p. 232); Control of Fire-Blight Infection of Apple Blossoms, by A. M. Musser (pp. 310–312); A Physiological Study of Fruit Development in the Pecan (*Hicoria pecan*), by C. L. Smith and C. J. B. Thor (pp. 315, 316); Nature and Control of *Cladosporium fulvum* (Tomato Leaf Mold), by F. S. Andrews (pp. 320, 321); Studies on Potato Scab [*Actinomyces scabies*] Control, by J. J. Taubenhaus (p. 329); Studies on Nailhead Spot of Tomatoes [Due to *Alternaria tomato* n. comb.], by G. F. Weber (p. 330); Studies on the Control of the Seedling Blight Disease of Rice in Arkansas [Mostly Due to *Helminthosporium oryzae*], by E. M. Cralley (p. 330); Treatment of Sweet Potato Plants for the Control of Black Rot, by L. E. Miles (p. 331); Preliminary Report on an Anthracnose Disease of Lima Beans, by T. D. Persons (pp. 331, 332); A Report on the Use of Creosote Oil to Control San Jose Scale and Peach Leaf Curl, by W. W. Stanley, S. Marcovitch, and J. O. Andes (pp. 332, 333); Recent Investigations of Cotton Root Rot in Texas, by D. C. Neal (pp. 333, 334); Reversible Vegetative Dissociation of Strains of *Phymatotrichum omnivorum*, by W. N. Ezekiel and J. J. Taubenhaus (p. 334); Studies on the *Fusarium* Wilt of Cotton, by V. H. Young and J. O. Ware (p. 335); Seed Treatment Studies With Fungicidal Dusts at the Arkansas Experiment Station (pp. 336,

337) and Observations on the Control of Black Rot [*Guignardia bidwellii*] of Grapes (pp. 337, 338), both by V. H. Young; Progress Report on the Control of Fire Blight, by H. R. Rosen (p. 338); High Points in Apple Spraying in Tennessee, by J. O. Andes (p. 339); Control Measures for Rosette of Blackberries and Dewberries in Louisiana, by A. G. Plakidas (p. 339); *Stilbum* [*cinnabarinum*] on Fig in Louisiana, by E. C. Tims (p. 340); New or Unusual Diseases Reported or Observed in Mississippi in Recent Years, by T. D. Persons (pp. 340, 341); *Sorosphaera veronicae* (Schr.) on Corn or Wall Speedwell, *Veronica arvensis*, by L. Donald (pp. 341, 342); *Verticillium* Wilt of Cotton in Greece, by L. E. Miles (p. 342); Further Studies on the Toxic Principles That Determine Immunity of Monocotyledonous Plants to *Phymatotrichum* Root Rot, by W. N. Ezekiel, J. J. Taubenhaus, and J. F. Fudge (pp. 343, 344); *A Rhizoctonia* Bud Rot in Strawberry, by A. N. Brooks (pp. 569, 570); Mode of Action of Bordeaux on *Mycosphaerella fragariae*, by A. G. Plakidas (p. 570); *Sclerotium rolfsii*, Sacc., on Strawberries and the Effect of Certain Chemicals on the Sclerotia, by R. E. Nolan (pp. 570, 571); Further Studies of Anthracnose and Wilt of Strawberry Caused by *Colletotrichum fragariae*, by A. N. Brooks (pp. 571, 572); A Root Rot of Strawberry Caused by a Species of *Diplodia*, by R. E. Nolan (p. 572); A Bark Disease of Tahiti Lime Trees Caused by *Phomopsis citri* Fawcett and *Diplodia natalensis* Evans, by W. B. Tisdale (pp. 572, 573); The Control of Diseases of Tomato Seedlings, by F. Van Haltern (pp. 573, 574); Preliminary Report on Anthracnose Diseases of Eggplants, by T. D. Persons (pp. 574, 575); The Direct Effect of Bordeaux Mixture, for the Control of Downy Mildew, on Early Cucumber Production, by G. F. Weber (p. 575); On a Black Crown Rot of Greenhouse Snapdragons Caused by *Myrothecium roridum* Tode, by J. J. Taubenhaus (pp. 575, 576); *Sclerotinia* Rot of Irish Potatoes in Florida, by A. H. Eddins (p. 576); Seeds of Watermelons and Okra as Possible Carriers of *Fusarium* Wilt, by J. J. Taubenhaus (p. 576); Control of Sweet Potato Stem Rot in West Tennessee, by G. M. Stone (p. 577); Apple Black Root Rot, by J. O. Andes (p. 577); Effect of Crown Gall, Hairy Root, and Woolly Aphids on Apple Trees in Orchard, by C. D. Sherbakoff and J. A. McClintock (pp. 577, 578); Report of One Year's Test of Copper Fungicides and Other New Materials as Sprays on Peaches, by L. E. Miles (p. 578); Breeding Peanuts for Disease Resistance, by B. B. Higgins (pp. 578, 579); *Lespedeza sericea* Stem Blight, by J. K. Underwood (p. 579); Only Certain Strains of Tobacco Mosaic Cause Mosaic-Burning, by W. D. Valleau and E. M. Johnson (p. 580); Studies on Downy Mildew of Tobacco, by C. B. Sumner and G. M. Armstrong (pp. 580, 581); Tobacco Bed Soil Disinfection, by J. O. Andes (p. 582); Do Necrotic Lesions Result in Localization of Tobacco Mosaic Viruses in *Nicotiana?* by W. D. Valleau (pp. 582, 583); Field Studies of *Fusarium* Wilt of Cotton, by C. D. Sherbakoff and G. M. Stone (p. 583); Angular Leaf Spot of Cotton in Mississippi in 1934, by L. E. Miles (pp. 584, 585); The Etiology of Sore-Shin, or Damping-off, of Cotton (p. 585) and A Résumé of Cottonseed Treatments in South Carolina (pp. 585, 586), both by C. H. Arndt; The Reaction of Several Isolations of the Cotton Wilt Fungus to Toxic Dyes, by G. M. Armstrong and C. N. Clayton (p. 586); Further Studies of the Effect of Ammonia-Nitrogen on the Growth of the Cotton-Root-Rot Fungus, *Phymatotrichum omnivorum*, in Field and Laboratory Experiments, by D. C. Neal (pp. 587, 588); Investigations of the *Verticillium* Wilt Disease of Cotton.—Preliminary Report, by L. E. Miles (p. 588); Dissemination of the Bacterial Leaf-Spot of Cotton, by F. M. Rolfs (p. 589); Wilt Resistant Cottons Adapted to the Gulf Coastal Plains, by D. C. (p. 590); and The Control of Wilt and Rust, by V. H. Young, J. O. Ware, and O. A. Pope (pp. 590, 591).

The Plant Disease Reporter, July 15 and August 1, 1936 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 20 (1936). Nos. 13, pp. 201–217, figs. 2; 14, pp. 219–237*).—The following items noted are of current interest:

No. 13.—Phymatotrichum omnivorum found in Nevada, by C. J. King; a survey of root disease in some conifers and hardwoods caused by *Phytophthora cambivora* (*P. cinnamomi*), by B. S. Crandall; summary of 9 years' experience with rhododendron wilt and root rot due to *P. cambivora*, by R. P. White; simultaneous infections of strawberries with crinkle and yellows (xanthosis), and a probable first report for the United States of anther and stigma blight of Youngberry (a hybrid dewberry) in Oregon, due to *Haplosphaeria deformans*, both by S. M. Zeller; a phosphorus soil deficiency disease causing unusual damage to corn in central Illinois, by B. Koehler; diseases of Austrian winter peas, by J. L. Weimer; and droughts in the United States, by J. B. Kincer.

No. 14.—First blister rust (*Cronartium ribicola*) found in California (on *Ribes* and *Pinus lambertiana*), by W. W. Wagener and J. L. Mielke; an epiphytotic of algal spot (*Cephaleuros*) on a wide variety of host plants in southern Florida, by G. D. Ruehle; tomato diseases destructive in Mississippi—drought a contributing factor, by P. R. Miller; and curly top of tomato in Utah, by H. L. Blood.

[Phytopathological studies by the Indiana Station] (*Indiana Sta. Rpt. 1935, pp. 23–27, 47, 57, 58, figs. 5*).—Progress reports are given on corn disease investigations (in cooperation with the U. S. D. A. Bureau of Plant Industry), including breeding and selection for resistance to diseases and abnormal conditions, as well as for better corn types; wheat disease investigations; *Phytophthora cactorum* trunk canker of apples; tomato diseases; aster wilt; potash deficiency symptoms in growing plants; spray residues as influenced by spray schedules and washing treatments; and the effect of leaf rust (*Puccinia triticina*) on the yield, composition, and quality of wheat (in cooperation with the U. S. D. A. Bureau of Plant Industry).

Kansas mycological notes, 1934, C. L. Lefebvre and C. O. Johnston (*Kans. Acad. Sci. Trans., 38 (1935), pp. 101–103*).—This contribution by the Kansas Experiment Station gives miscellaneous notes on noteworthy species of fungi, including diseases that are apparently becoming more definitely established in the State, the incidence and effects of climatic factors with reference to diseases of small grains and corn, *Diatrype stigma* on oaks, *Nummularia clypeus* on soft maple, *Phyllosticta apiculis* on golden willow (*Salix vitellina*), *Gymnosporangium globosum* on hawthorn (*Crataegus crus-galli*), rotting of floor timbers by *Poria incrassata*, and a list of 14 species of fungi recently collected (10 species not previously recorded for the State).

[Phytopathological studies by the Rhode Island Station] (*Rhode Island Sta. Rpt. [1935], pp. 18–20, 23, 24, 26–28*).—Progress reports are given on studies of visible spray burn on apple leaves by lime-sulfur and copper sulfate solutions; the influence of sprays on CO_2 assimilation by apple leaves; apple orchard spray tests with various lime-sulfur and bordeaux mixtures; spray injury to tomato leaves, and the influence of environmental factors; the pink patch turf disease (*Corticium fuciforme*) and its control; and spray tests with late tomatoes in the field, using various copper fungicides.

[Phytopathological studies by the Tennessee Station] (*Tennessee Sta. Rpt. 1934, pp. 15, 28, 29–32*).—Progress reports are included on the breeding and selection of tomato varieties resistant to leaf spot, by S. H. Essary; selection of pears for resistance to fire blight, and chemical control of nematodes, by B. D. Drain; wheat head blight and root rot, by C. D. Sherbakoff; spray tests against black rot, fire blight, and other prevailing apple diseases, by

J. O. Andes; and selection of cotton strains for resistance to *Verticillium* wilt, by Stone.

The problem of specialization and variation in phytopathogenic fungi, E. C. STAKMAN (*6. Internatl. Bot. Cong., Amsterdam, 1935, Proc., vol. 1, pp. 30–35*).—This contribution by the University of Minnesota sets forth briefly the general principles involved and the present state of our knowledge of the subject, and summarizes the work of the university on the problem of the origin of new races of certain smut fungi (particularly corn smut).

Notes on southern Appalachian fungi, L. R. HESLER (*Jour. Tenn. Acad. Sci., 11 (1936), No. 2, pp. 107–122, figs. 7*).—This contribution by the University of Tennessee is an annotated list of fungi (Ascomycetes, Uredinales, Tremellales, Thelephoraceae, Hydnaceae, Polyporaceae, Agaricaceae, and Fungi Imperfecti) collected in the State, including two first reports for North America (*Stereum duriusculum* and *Tremella tuberculariа*), several species out of their reported range, and new hosts or substrates for various fungi.

The development of Lycoperdon acuminatum, D. SWARTZ (*Mycologia, 28 (1936), No. 3, pp. 278–283, figs. 9*) —This contribution from the University of Arkansas describes the developmental stages of the species, comparisons with other species showing it to be most closely related to *L. wrightii*.

Plant viruses, K. M. SMITH (*London: Methuen & Co., [1935], pp. IX+107, figs. 11*).—The author's stated aim was "to bring to the notice of workers in other branches of science, and particularly botanists and entomologists, some of the more interesting and important facts of the study of plant viruses. . . . The references [94 titles] at the end of the book are not intended to be exhaustive but are selected as being representative of the main lines of plant virus research." They include references through 1934, with a few for 1935. The work constitutes a comprehensive, critical, analytical review, including a historical sketch of the earlier work on the group, the technic of study, natural modes of transmission, the virus in and outside of the host and in the insect vector, immunity, the nature and classification of viruses, control of virus diseases, and comparisons between the plant and animal viruses.

A brief index is provided.

The ring symptom of virus diseases of plants, E. M. JOHNSON and W. D. VALLEAU (*Kentucky Sta. Bul. 361 (1935), pp. 239–263, figs. 11*).—"Chlorotic or necrotic rings may be present as the only definite symptom or as an accompanying symptom in plants affected with various virus diseases. Rings may be present as local symptoms on inoculated leaves or as transitory or permanent symptoms on uninoculated, completely, or partially invaded tissue.

"The following tobaccco viruses capable of producing rings in tobacco are discussed: Ring tobacco mosaic (2 strains), yellow and white mosaic, cucumber mosaics, etch viruses, viruses from *Delphinium* sp., *Plantago major*, and *Mertensia virginica* (possibly cucumber mosaic), and two unidentified viruses. Rings are also described as prominent symptoms in virus diseases of peony, lilac, delphinium, pepper, red clover, sweetclover, apple, plum, rose, and New England aster.

"It is suggested that the ring symptom is not diagnostic for any specific virus disease because similar rings may occur in plants, especially tobacco, affected with such unlike viruses as tobacco ring spot, healthy potato, etch, tobacco mosaics, cucumber mosaics, and others. Usually other symptoms accompany the rings which make classification possible, but sometimes property and host-range studies may be necessary for more exact classification."

Studies on the effect of carborundum as an abrasive in plant virus inoculations, T. E. RAWLINS and C. M. TOMPKINS (*Phytopathology, 26 (1936), No. 6, pp. 578–587, fig. 1*).—By the use of 600-mesh, powdered carborundum dur-

ing inoculation, it was possible in these studies at the University of California to transmit readily a number of viruses hitherto refractory by other methods. Among these viruses are those causing spotted wilt of tomato and lettuce, broadbean mosaic, a California celery mosaic, cauliflower mosaic, and sugar beet mosaic. Attempts to transmit curly top of sugar beet, California aster or celery yellows, or brown blight and big vein of lettuce were unsuccessful.

Histological studies demonstrated that in leaves inoculated by this method the epidermal cells are frequently pierced by the carborundum crystals and that the points of the crystals are small relative to the cell size. This evidence favors the theory that the crystals may pierce leaf cells and allow virus particles to enter, but in certain cases do not injure the pierced cells sufficiently to prevent virus multiplications therein.

Further experiments on the question of the relation of mildew resistance to plant nutrition [trans. title], E. Lowig (*Ernähr. Pflanze, 32 (1936), No. 4, pp. 61–67, figs. 18*).—From experiments with oats, meadow grass, orchard grass, crimson clover, and *Phalaris arundinacea* it is concluded that silicic acid in the form of its potassium salts and also as a constituent of Thomas meal possesses a protective action against mildew. From these results, together with the work of other investigators, it is considered that this increase in mildew resistance is a specific effect of silicic acid.

Between the nitrogen content and mildew infection there was, within certain limits, a direct proportionality.

Analyses indicated that with silicic acid fertilization the silicon content in the plant could be considerably raised.

Preparation of bordeaux mixture with special reference to the use of commercial hydrated lime, O. Butler (*New Hampshire Sta. Circ. 49 (1936), pp. 8, figs. 2*).—Bordeaux mixtures made with equal weights of quicklime or of commercial hydrated lime are not equivalent, and substitution of the latter in a bordeaux formula affects both the transparency and the adhesive quality of the mixture (the former only slightly, but the latter noticeably and adversely when mixtures of the type of 4–2–50 are used). The dispersion of the copper precipitate in bordeaux mixture is readily measured by the rate of settling. In mixtures using strong lime to weak copper or the reverse, good results follow in both cases if quicklime is used, but when commercial hydrated limes are employed the sedimentation rate is markedly affected by the strength of the mixture in $CuSO_4$, the ratio of $CuSO_4$ to lime, and the method of mixing, but practically not at all by the fineness of the hydrate used when the method of mixing forms washes settling at the same rate as the preparation from quicklime. "The data also show that whenever strong lime to weak copper produces rapidly settling mixtures then the fineness of the hydrated lime substantially affects the rate of settlement and a distinct benefit ensues from the use of very finely ground commercial hydrate. And conversely when bordeaux mixtures are prepared from commercial hydrated limes, the degree of fineness of the lime used is without importance when strong copper to weak lime is the method of mixing employed."

Based on the data obtained, detailed procedures for the preparation of bordeaux mixtures are given.

Greenhouse wires and pipes galvanized with zinc react with sulphur dioxide to form soluble zinc salts, K. J. Kadow, W. A. Ruth, and H. W. Anderson (*Phytopathology, 26 (1936), No. 6, pp. 609, 610*).—This note from the University of Illinois reports injury to tomatoes due to the dripping of condensed moisture from zinc-galvanized pipes and wires following sulfur dioxide fumigation used against several greenhouse diseases.

Some of the factors influencing the infection and pathogenicity of Ustilago zeae (Beckm.) Unger on Zea mays L., G. N. DAVIS (*Iowa Sta. Res. Bul. 199 (1936), pp. 247–278, figs. 12*).—A survey (near Ames, Iowa) of corn smut based on visible smut galls, from 1930 to 1934, showed 10 6, 9.9, 13 9, 5.5, and 18 3 percent of affected plants, respectively. When the leaf sheaths were stripped from 1,985 plants exposed to natural and artificial infection in 1934, many small smut galls (39.3 percent of the total expressed infections) were found at the nodes.

A decrease in surface tension of the inoculum increased its infectivity. Of 500 Golden Bantam plants, 92 percent became infected when inoculated with a sporidial suspension in carrot filtrate plus 1 percent fish-oil soap, while of 90 similar plants 36.6 percent became infected when inoculated with a suspension in carrot filtrate alone.

Increased bud growth was accompanied by a larger number of nodal infections. Axillary bud growth was stimulated by injury to the plant or by inhibition of pollination. Injured or unpollinated plants produced about twice as many smut galls as the controls. Histological examination of 262 axillary buds from 50 inoculated Golden Bantam plants showed 53.6 percent of the buds with smut mycelium. Mycelium was found in apparently healthy axillary buds 67 days after inoculation.

The percentage of smut infection as indicated by nodal smut galls increased with lateness of planting, an average for 2 yr. showing 12 percent on May 15 plantings and about 40 percent on June 4 plantings. The percentage of infection as indicated by nodal smut galls showed a tendency to increase both ways from the 2–3 rates of planting. For 1931 to 1934, inclusive, those plants growing 1 to a hill showed 40.8, 20.4, 9, and 22.8 percent infection, respectively; those at 3 to a hill 22.5, 13.5, 4.3, and 14.6 percent; and those at 5 per hill 32.4, 21.6, 5 9, and 18.5 percent.

Effect of treatment of oats on the development of saccharogenic and dextrinogenic amylases during germination, N. M. NAYLOR and V. L. DAWSON (*Iowa State Col. Jour. Sci., 10 (1936), No. 3, pp. 267–274*).—In this study at Iowa State College, fumigation of grain with the heavier-than-air vapors of carbon disulfide, ethylene dichloride, and ethylene oxide-carbon dioxide were effective in controlling fungus growths. The carbon-disulfide treated grain germinated well and showed rapid development of saccharogenic and dextrinogenic enzymes high in activity. Grain treated with ethylene oxide-carbon dioxide germinated slowly and showed no appreciable increase in amylase activity until the fifth day of germination. This treatment affected the saccharogenic and dextrinogenic enzymes alike, apparently slowing up enzyme production or causing permanent injury to it. Ethylene dichloride had a greater depressing effect on the saccharogenic than on the dextrinogenic enzyme.

Enzyme precipitates were made from extracts of carbon-disulfide treated oats germinated for 3 and for 8 days. Fractional precipitation with alcohol produced an enzyme preparation of high activity from the extract of the oats germinated 8 days. From this extract, the 65 percent alcohol precipitate showed a saccharogenic power of 695 and a dextrinogenic power of 83,300.

Relation of stomatal function of wheat to invasion and infection by leaf rust (Puccinia triticina), R. M. CALDWELL and G. M. STONE (*Jour. Agr. Res. [U. S.], 52 (1936), No. 12, pp. 917–932, figs. 4*).—In this cooperative contribution by the Indiana Experiment Station and the U. S. D. A. Bureau of Plant Industry, a simple technic is described for studying the entrance phenomena of a rust in relation to stomatal aperture. This involves stripping the inoculated epidermis away from the mesophyll cells and fixation in absolute alcohol containing a suitable stain. The initial open condition of stomata of seedling

wheat, prior to appressorium formation, proved to be unnecessary to the entry of *P. triticina* (18 cultures comprising 7 physiologic forms). Limited studies suggested the same relation for mature plants. The normally closed stomata of wheat seedlings provided no openings through which the entry hyphae could pass without first overcoming the resistance exerted by the tightly closed guard cells. When an appressorium was initiated on an open stoma of a seedling leaf, the stoma closed tightly prior to entry. The appressorium originating from the urediospore appeared to function as a specialized organ for applying pressure between the closed guard cells, thereby effecting a forceful opening of the stoma and entry by the fungus. Since closed stomata offered no effective barrier, it was concluded that there is no possibility of "functional resistance" to this rust through delayed morning opening of stomata. Appressoria of clover rust (*Uromyces trifolii*) also caused wheat stomata to close, and were observed to effect numerous entries through initially closed stomata of seedling wheat leaves.

The stem rust epidemic of 1935 in Kansas, C. O. JOHNSTON, L. E. MELCHERS, H. H. LAUDE, and J. H. PARKER (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1936, Sup. 92, pp. 19–30, figs. 3*).—This contribution by the Kansas Experiment Station in cooperation with the U. S. D. A. Bureau of Plant Industry gives a survey of the known factors in this epidemic, which was the first one of major importance since 1923 and the most severe and destructive since that of 1904. It is concluded that the proper combination of the following factors was responsible: Heavy infection of very susceptible wheats in north-central Texas; prevailing southerly winds of the central plains area which carried rust spores into Kansas during May and June; heavy and frequent rains, high relative humidities, frequent dews, and favorable temperatures during the last half of May and all of June; late tillering and heading due to early spring drought; a long fruiting period brought about by heavy rains and subnormal temperatures of May and June; and the susceptibility of commercial wheat varieties in Kansas.

Several years' observations have shown that wheat stem rust overwinters with annual regularity in central and southern Texas, and that the susceptible Mediterranean wheat of north-central Texas furnishes an ideal propagation ground. Severe epidemics of stem rust thus can be expected to sweep northward whenever the proper sequence of favorable conditions occurs. The experience of 1935 would indicate a definite need for stem rust-resistant varieties both for north-central Texas and for the hard red winter wheat area of the central plains.

Inheritance of resistance to the common mosaic virus in the bean, M. C. PARKER (*Jour. Agr. Res. [U. S.], 52 (1936), No. 12, pp. 895–915, fig. 1*).—In this cooperative study between the Wisconsin Experiment Station and the U. S. D. A. Bureau of Plant Industry reciprocal crosses between the mosaic-resistant Michigan Robust and the susceptible Stringless Green Refugee varieties reacted quite differently to the mosaic virus employed. It was found that the maternal parent governs to a large extent the reaction of the hybrid offspring. In the F_1, all plants were susceptible from the cross Stringless Green Refugee × Michigan Robust, and 82 percent were resistant from the cross Michigan Robust × Stringless Green Refugee. The influence of the grandmaternal parent was still very evident in the F_2. From the cross Stringless Green Refugee × Michigan Robust, 99 percent of the F_2 were susceptible to mosaic, whereas 56 percent from the reciprocal cross were resistant. In the F_2 the reciprocal crosses were still very different. From the cross susceptible × resistant, 91 percent were susceptible and 9 percent resistant. From resistant × susceptible, 35 percent of the F_2 were resistant and 65 percent susceptible. Throughout the

three generations studied there was evidenced a very marked convergence of results. Corbett Refugee (resistant) was also used in reciprocal crosses with the above varieties, with results still different from those between Stringless Green Refugee and Michigan Robust. All F_1 individuals of the reciprocal crosses were resistant, but a difference appeared in the F_2. Corbett Refugee × Michigan Robust gave 7 percent susceptibles in the F_2, and Michigan Robust × Corbett Refugee 9 percent.

The dominant influence of the maternal parent in the reaction of hybrids is explained by assuming that the cytoplasm or some extranuclear inclusion governs the immediate reaction of the plant to the virus, and that, although the ultimate control of expression is nuclear, the expression of the action of the genes is delayed. It is further assumed that certain genotypes change the reaction of the cytoplasm more rapidly than others.

Comparative studies of some European and American potato viroses, T. P. DYKSTRA (*Phytopathology, 26 (1936), No. 6, pp. 597–606, figs. 4*).—In this cooperative study by the Oregon Experiment Station and the U. S. D. A. Bureau of Plant Industry, a number of potato varieties from both continents were tested against the viruses in question. Virus X was found to be similar to the so-called latent virus of "healthy" American commercial potatoes. Virus Y and the vein-banding virus (rugose mosaic complex with the X component removed) belong to the same group but are not identical. Paracrinkle does not resemble leaf-rolling mosaic or any other known American virosis. Crinkle A is not identical with rugose mosaic, but resembles mild mosaic, though the mottled pattern differs somewhat and the crinkling is less severe. Virus C does not resemble any of the known American forms of potato viruses. Details as to varieties used and symptoms obtained are given.

Seed transmission of potato virus diseases, D. REDDICK (*Amer. Potato Jour., 13 (1936), No. 5, pp. 118–124*).—It was found in this study at Cornell University that seed transmission of the potato virus disease acropetal necrosis [=vein-banding virus?] occurs in a low percentage of cases. Some evidence is presented pointing to the possibility that virus entry into the embryo may be effected through the pollen. The findings are significant in potato-breeding programs where newly produced plants must be grown in the open, and especially in regions where *Myzus persicae* is likely to be prevalent. Inferential evidence is also presented that acronecrosis and leaf roll, also caused by viruses, may be transmitted through the true seed.

The value of disease-free foundation stock for breeding purposes is indicated. The proportion of healthy offspring from diseased parents is so high that a particular plant of great value may be used as either parent in hybridization, even though affected with a communicable disease of virus type. In cases where diseased plants have been used in a cross, the production of the first crop of seedlings under conditions permitting complete control of virus-disease vectors is indicated.

The yellows and mosaic diseases of sugar beets and fodder beets [trans. title].—**I, History of the investigation on virus yellows and mosaic,** H. M. QUANJER; **II, Investigation on virus yellows and some remarks on mosaic,** G. ROLAND (*Tijdschr. Plantenziekten, 42 (1936), No. 3, pp. 45–70, pls. 5; Eng. abs., pp. 64–66*).—This is a general summary of the published results of studies on these beet diseases.

The curly-top resistant beet variety, A. W. SKUDERNA, C. PRICE, J. O. CULBERTSON, and C. E. CORMANY (*Facts About Sugar, 31 (1936), No. 1, p. 17*).—In field plantings (1932–34) in certain beet-growing areas of California, Idaho, Utah, and Colorado, the U. S. No. 1 variety far surpassed in resistance the commercial brands with which it was compared and the yields and quality

were satisfactory. In years of greatest curly top severity this variety outyielded the commercial brands, on an average, by 4 tons or more of beets per acre.

Some indications of a relation of soil fertility and plant nutrition to cane diseases in Hawaii, A. F. HECK (*Jour. Amer. Soc. Agron., 26 (1934), No. 5, pp. 381–389*).—This chemical study of cane juice and of the soil conditions under which cane is produced, made at the Wisconsin Experiment Station, seems to indicate a correlation between readily available plant nutrients and susceptibility to some Hawaiian cane diseases. Growth failure appears to be due to a *Pythium* (*P. aphanidermatum*) root rot induced under an unbalanced nutrition in which low phosphorus and high mineral nitrogen are more or less outstanding. The history of the sugar industry in Hawaii seems to indicate that this trouble has been on the increase.

Eye leaf spot (*Helminthosporium sacchari*) damage is usually associated with high mineral nitrogen and perhaps low potassium, but more especially with the former. The most damage is done by the "runner" and less by the immediate lesion.

Brown stripe (*H. stenospilum*) seems to be associated with low mineral assimilation, which may be low for phosphorus or potassium or for both, or it may be associated with an unbalanced condition of phosphorus and potassium with nitrogen. The evidence seems to show that assimilation of sufficient phosphorus and potassium in a balanced relation aids greatly in minimizing the injury from this disease. Resistant varieties usually are either berter feeders on the phosphorus and potassium of the soil or are able to make normal growth by using less of these nutrients in their metabolism, thus leaving more of them in solution in the juice.

Notes on Pythium root rot.—VIII, Absorption of essential elements by segregated roots of sugar cane, C. W. CARPENTER (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 40 (1936), No. 2, pp. 137–142, figs. 4*).—Studies previously reported (E. S. R., 72, p. 798) indicated that different roots could supply the plant with specific elements available in their vicinity and that soil solutions corresponding to a complete nutrient solution thus might not be required at any one point in the soil for the plant to function normally. These results led to the experiments here described, wherein each of the nine elements considered essential for normal cane growth was supplied to individual plants through a separate root by a technic described in detail. For each of the tests, three plants of uniform size were selected. One was held as a control and grown continuously in a complete nutrient solution. All but ten of the roots of each of the other two plants were excised, and nine roots of each were detoured, respectively, into the nine solutions, each of which contained a salt supplying one of the nine essential elements (viz, N, P, K, Ca, Mg, Fe, Mn, B, and Si). The tenth root of each plant was detoured into distilled water. The experiment was repeated, and in both cases the dissimilarity in the roots in the various solutions was striking. The largest mass of white, vigorous roots developed in the calcium chloride solution. These root masses were in marked contrast to those developing in any of the other solutions. It is not assumed that these limited tests are complete enough for far reaching interpretations, but it is thought that experiments of this nature may provide useful information regarding the cane plant.

In pot tests with the Hamakua growth-failure soil, here noted, applications of phosphorus and calcium tended to increase the resistance of cane and Sudan grass to Pythium root rot. It was also shown that part of the response following large applications of phosphate to certain soils was due to the calcium portion of the fertilizer.

Physical properties of sugarcane mosaic virus, S. A. RAFAY (*Indian Jour. Agr. Sci., 5 (1935), No. 6, pp. 663–670, fig. 1*).—Using a standardized technic here described, this virus was shown to resemble crinkle mosaic of potato in tolerating a 1:10 dilution, but it lost its potency in 2 hr. whereas the virus of spotted wilt of tomato is inactivated in 6 hr. The filter paper filtrate was noninfective, but the residue induced mosaic. This virus is reported to be one of the most sensitive and least resistant to chemical reagents, as tested against HCl, HNO_3, $HgCl_2$, NaCl, $CuSO_4$, H_2O_2, formalin, zinc powder, and MgO_4.

Tobacco diseases, W. D. VALLEAU and E. M. JOHNSON (*Kentucky Sta. Bul. 362 (1936), pp. 62, figs. 28*).—This handbook first takes up recommendations for the control of tobacco diseases in Kentucky and gives a general discussion of the causes of these diseases and of the relation of the soil to them. The main body of the text then deals with specific diseases under the following groupings: Physiological diseases, plant bed diseases, seed treatment, and root, leaf, virus, and stalk diseases. A final section deals with houseburn, which results from the growth of micro-organisms in the dead leaves during periods of high humidity in the curing house.

Downy mildew (blue mold) of tobacco (*N. C. Dept. Agr. Bul., 1934, Dec., pp. 16, figs. 6*).—This is a general discussion of tobacco blue mold, including the history of the disease, the hosts, symptoms, and cause; the factors influencing the occurrence, rate of spread, and degree of destructiveness; and a summary of measures for its prevention and control. The results reported are largely from cooperative work between the Tobacco Experiment Station of the North Carolina State Department of Agriculture and Duke University.

Studies on the origin of yellow-mosaic viruses, J. H. JENSEN (*Phytopathology, 26 (1936), No. 3, pp. 266–277, fig. 1*).—Tobacco plants believed to have been infected by single units of tobacco-mosaic virus (because they were exposed to exceedingly small amounts of this virus through inoculations made with single pin punctures or with virus samples reduced to low activity by chemical treatment, ultrafiltration, or high dilution) showed, in addition to the ordinary mottling symptoms, occasional bright yellow spots on their leaves. From these spots yellow-mosaic strains were isolated that were distinct from tobacco mosaic. Thus further evidence was brought that yellow-mosaic viruses arise in plants infected with tobacco-mosaic virus. On the basis of rates of movement in host plants, on infectivity, and on symptom differences, it is concluded that many, if not all, of the 51 yellow-mosaic strains isolated from yellow spots differ from each other and from tobacco mosaic, and yet certain properties, host reactions, and serological relationships demonstrate them to be strains of tobacco-mosaic virus.

These findings are believed to indicate that new strains of virus arise suddenly in plants affected with tobacco mosaic by some process similar to mutation in species of living organisms.—(*Courtesy Biol. Abs.*)

Susceptibility of tobacco plants visibly affected with mild tobacco mosaic to other strains of the virus, E. M. JOHNSON and W. D. VALLEAU (*Kentucky Sta. Bul. 360 (1935), pp. 192–201, figs. 2*).—"Turkish tobacco plants having 6 to 7 leaves were inoculated with various natural strains of mild green tobacco mosaic and, 7 to 15 days later, when infection was systemic, with the virus of white or yellow tobacco mosaic. When mild mosaic plants were inoculated with either white or yellow tobacco mosaic on leaves not previously inoculated, they developed symptoms of white or yellow tobacco mosaic in the tip leaves in 10 to 19 days. Similar plants inoculated with either white or yellow mosaic only showed symptoms in the tip leaves in 7 to 10 days. When inoculations were made with white mosaic on leaves previously rubbed with mild mosaic, symptoms of white mosaic were visible in the new leaves of some of the plants

in 20 to 60 days. Symptoms of white or yellow mosaic were slightly less conspicuous and appeared later in plants affected with mild mosaic than in plants affected with only white or yellow mosaic."

Localization and resistance to tobacco mosaic, in Nicotiana, W. D. VALLEAU (*Kentucky Sta. Bul. 360 (1935), pp. 203–230, figs. 7*).—Several strains of tobacco-mosaic virus collected in Kentucky cause necrotic spotting in certain tobacco varieties, but this property may be lost from such a virus. The majority of Kentucky-grown varieties develop necrotic spots when inoculated with white or aucuba mosaic. Localization of the latter occurred in the inoculated leaf in 40 percent of 130 necrotic-spotting plants growing in the field, and systemic infection of the remainder was accompanied with extreme necrosis. In the mosaic-resistant variety Ambalema, necrotic-spotting viruses appear to be completely localized in the necrotic spots. No sharp line can be drawn between localization and the usual systemic infection of tobacco plants with the common tobacco-mosaic viruses. A complete series between these extremes can be demonstrated if a series of *N. glutinosa*, *N. langsdorffii*, *N. sanderae*, *N. rustica*, and *N. tabacum* plants of different ages are inoculated with several tobacco-mosaic viruses differing greatly in symptom expression. Necrotic spotting is merely an index to the degree of cellular sensitivity to the virus, and the term "localization", if used, should be reserved for cases of necrotic spotting where the virus is confined within the inoculated leaf. Localization cannot be expected to have value in the control of mosaic in our present varieties of tobacco, because the common strains of tobacco mosaic are nonnecrotic-spotting strains.

It is concluded that two types of resistance to the tobacco-mosaic viruses may be recognized in *N. tabacum*, viz, one in which certain strains of the virus are sometimes prevented from inducing systemic infection by a high degree of sensitivity in the invaded cells, with localization in inoculated leaves, and a second type exemplified in the resistance shown by Ambalema to nonnecrotic virus strains, in which the virus is inhibited from entering the young tissues. Failure of a virus to enter the seeds may thus be due to its inability to invade meristematic tissue. It is suggested that plants which are most sensitive to a virus (necrotic-spotting forms) are those in which the virus multiplies most rapidly (e. g., *N. glutinosa*), and those least sensitive are plants in which the virus finds the poorest medium for multiplication (e. g., Ambalema). It is believed that a transfer of the resistance of Ambalema, either with or without necrotic spotting, to our commercial varieties should prove a practical solution of the tobacco-mosaic problem.

Burning and non-burning strains of tobacco mosaic, W. D. VALLEAU and E. M. JOHNSON (*Kentucky Sta. Bul. 361 (1935), pp. 233–238, fig. 1*).—Mosaic burn, a disease affecting some of the leaves of mosaic plants which are without mosaic patterns, appeared in plants inoculated from "burned" plants, but not in those inoculated with nonburning strains of virus. The evidence is also sufficient to show that there are several burn strains which differ in symptoms. Of 35 White Burley varieties or hybrids, 22 of dark air-cured and dark fired tobacco, and 11 F_1 hybrids of Kentucky tobaccos with Ambalema, and plants of Ambalema inoculated with a burning strain of mosaic virus, all except Ambalema developed readily observable mosaic burn. Mosaic burn is evidently an invasive symptom, as it is apparently limited almost entirely to tissue young enough to be invaded rapidly by the virus, but does not occur on leaves with completed growth at the time of inoculation or in those produced after the appearance of mosaic symptoms in the growing point. Burn on leaves with mosaic patterns was usually confined to the older, patternless, distal part of the leaf. The symptoms range from a few nearly circular, necrotic spots to

numerous coalescing spots which finally kill the tissue of large areas of the leaf. Infection of White Burley tobacco with either a burning or a nonburning strain at topping time sometimes tends to improve rather than injure the quality. The distribution of mosaic burn is probably coextensive with the tobacco industry.

Factors affecting the formation of local lesions by tobacco mosaic virus, J. CALDWELL (*Roy. Soc. [London], Ser. B, 119 (1936), No. 815, pp. 493–507, pl. 1, figs. 3*).—Many viruses produce local lesions when the plant juices containing them are rubbed on the leaves of appropriate plants. It is known that this effect may be reduced or even abolished by the addition of certain substances, e. g., normal serum, to the virus-holding juice. The action of these inhibitory substances may be either directly on the virus itself, e. g., by neutralizing its infectivity, or indirectly on the leaves of the rubbed plant, e. g., by reducing their susceptibility, and it is a matter of some moment to distinguish between these two modes of action. A method is suggested whereby the distinction can be made by comparing the effects of dilution of the virus and of the inhibitory substance. The action of various enzymes on the virus activity is discussed, and in particular the effect of trypsin is studied experimentally and shown to be in the main an action on the virus not necessarily proteolytic. The inactivating effects of normal serum and of silver nitrate are studied and found also to be due to action on the virus. The use of the method described may make possible a direct chemical examination of the virus agent, even in the presence of other constituents of the plant juice.

Mosaic from tobacco one to fifty-two years old, E. M. JOHNSON and W. D. VALLEAU (*Kentucky Sta. Bul. 361 (1935), pp. 264–271, figs. 2*).—Decoctions of 41 ground samples from 24 to 39 yr. old were used to inoculate 241 Turkish tobacco plants never touched by hands, of which 45 (representing 17 samples) developed mosaic of several recognizable strains. Seventy-six samples from 1 to 15 yr. old and known to contain mosaic when collected were used to inoculate 84 tobacco plants, of which 79 developed mosaic. There was no evident loss in infectivity in dried tobacco until after 8 yr. At least 12 strains of virus were tested and all survived in dried tobacco. Dried leaves from tobacco grown in 1882, used as inoculum on 30 plants, caused mosaic in 18, 2 strains, a yellow and a green distorting type, appearing.

The isolation of crystalline tobacco mosaic virus protein from diseased tomato plants, W. M. STANLEY and H. S. LORING (*Science, 83 (1936), No. 2148, p. 85*).—Using the technic previously reported (E. S. R., 73, p. 800), but with certain improvements, a crystalline protein was isolated from mosaicked tomato plants, possessing the same physical, chemical, and biological properties as those found for the protein from mosaicked tobacco plants. These results are believed to offer additional evidence for the identity of the protein with the agent responsible for the tobacco-mosaic disease.

Do tobacco plants recover from and develop immunity to ringspot? W. D. VALLEAU (*Kentucky Sta. Bul. 360 (1935), pp. 181–191, figs. 4*).—From the author's studies, combined with data from the literature, it is concluded that there are two sets of symptoms—invasive and occupative or systemic—and the ring and line patterns, as invasive symptoms, are not confined to the ring spot virus. There are many virus diseases in which the early, invasive symptoms differ markedly from the later symptoms. In ring spot-infected plants the later, patternless leaves continue to carry the virus in a rather high concentration, and infected plants can frequently be identified in the field, when no patterns can be seen, by the peculiar chlorosis or necrosis of the leaf edges of lateral shoots. The best reason for believing that ring spot plants do not recover is suggested by

the behavior of the yellowing strain previously described by the author (E. S. R., 68, p. 208).

"If we accept the proposition that the development of ring patterns occurs as the result of the invasion of masses of healthy tissue by the virus, and that the plant is still diseased following the production of patternless leaves, then the problem of immunity does not seem to enter into the failure of a second inoculation to produce rings. The cells of the patternless leaves are already affected to the limit by the virus, and the addition of a few more units of the virus to an occasional cell cannot be expected to produce an effect. If now we consider the protective effect of one strain of a virus against a more injurious strain, it would seem that exactly the same phenomenon is concerned as in the case of ring spot. . . . It appears better, for the time being, to speak of protection afforded by one strain of virus against a more injurious strain . . . rather than to speak of an acquired immunity in the sense in which this term is used in animal and human pathology."

Fruit diseases in 1935, W. D. MILLS (*N. Y. State Hort. Soc. Proc., 81 (1936), pp. 13–17*).—In this contribution by the [New York] Cornell Experiment Station notes are given on diseases of apples (including spray injury and the severe outbreak of scab), stone fruits, pear, quince, grape, and strawberry.

Little-leaf or rosette of fruit trees, IV, W. H. CHANDLER, D. R. HOAGLAND, and P. L. HIBBARD (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 11–19, figs. 3*).—Additional observations and experiments by the University of California (E. S. R., 72, p. 478) indicated that where the zinc fixation powers of soils are high treatment of the soil with zinc compounds is too costly, the results are uncertain, and the duration of the healthy condition of the tree is reduced. Additions of ferrous sulfate, gypsum, or ammonium sulfate to the zinc sulfate ($ZnSO_4$) failed to give the benefits which at first seemed apparent. Of affected peach, apricot, plum, citrus, and walnut trees sprayed with a $ZnSO_4$-lime mixture on the young foliage in the spring or early summer, all but the last benefited—citrus showing the best results. With or without lime, $ZnSO_4$ sprayed on mature foliage of peach, apricot, plum, apple, and walnut trees gave strong responses except for walnut. Spraying tests apparently indicated the inadvisability of using lime with the dormant $ZnSO_4$ treatment. It is believed that the beneficial effects of dormant spraying would be greater after a second annual application. Brushing fresh pruning wounds with strong $ZnSO_4$ gave better results with grapevines than with fruit trees. Driving of zinc-coated nails and pieces of zinc into the wood gave evidence of benefits through absorption, but before the results from this method, as compared with other treatments, can be ascertained more evidence must be accumulated regarding the danger of injury. Zinc phosphate and zinc carbonate (among the least soluble of zinc compounds) gave no improvement, nor did salts of aluminum, potassium, sodium, strontium, uranium, zirconium, and titanium.

Evidence is given that a tree may be making weak growth as a result of whatever it is that zinc corrects without developing either the characteristic spring rosettes of little leaves or the summer mottling.

Studies of the little-leaf disease in California, W. S. BALLARD and R. C. LINDLER (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 1–10*).—In these studies on the cause and control of little leaf, pot cultures of grapes containing various amounts and combinations of salts that might occur in alkali soils all failed to induce development of the disease, even when the soils used were from corral spots where little leaf had previously killed peach trees. Badly affected grapevines on a corral spot were cut back and grafted with healthy scions, but the latter developed little leaf. However, when a part of these vines were

transplanted to a different locality they all recovered. Diseased vines were replaced with healthy nursery stock, whereupon the latter developed little leaf. Cuttings from badly affected vines, when rooted in coarse, washed sand and later planted in fertile soil or sand in containers, all failed to develop little leaf. An experimental planting of fruit trees and grapes was made in a corral spot where badly diseased peach trees had been growing. Within 1 yr. or more little leaf had developed on peach, plum, pecan, apple, and walnut trees and on the grapevines so planted. A cover crop of alfalfa materially reduced the amount of little leaf in a vineyard so treated.

Soil treatment tests with various salts and acids were carried out in the field on various fruit trees and grapevines, only the zinc salts giving favorable results. The data indicated the dormant season to be the best time to apply the zinc sulfate soil treatment, as various fruits showed marked differences in susceptibility to injury. Of 45 organic and inorganic compounds tested by direct introduction into the trees or vines, only the soluble zinc salts have thus far produced unmistakable results. Of the zinc sprays tried, the zinc sulfate-ammonia produced the most striking results.

Whether the action of zinc is direct or indirect is undetermined, but the authors believe that these troubles are probably zinc deficiency diseases, though the final settlement of the problem rests on the growing of susceptible plants in a zinc-free medium. If these diseases are due to an injurious substance from the soil or produced in the plant, it would seem that some of the other metallic ions experimentally introduced should have rendered such a substance innocuous. On the other hand, if they are zinc deficiencies, the action of cover crops requires explanation. Finally, it is stated that no case of little leaf characters or of zinc deficiency has been reported for any annual plant.

Cherry leaf spot control, G. W. Keitt (*Canning Trade, 58 (1936), No. 32, pp. 7, 8; also in Canning Age, 17 (1936), No. 4, pp. 169, 170*).—This is a contribution from the Wisconsin Experiment Station.

A report of progress on studies of prune russet ("scab") and its control, P. W. Miller (*Oreg. State Hort. Soc. Ann. Rpt., 27 (1935), pp. 106–122, figs. 4*).—Russet, one of the major troubles of prunes in Oregon and Washington and occurring in practically all prune-growing sections of the Pacific Northwest, was studied during 1935 with the following preliminary conclusions:

Affected fruits are disfigured, causing considerable economic loss. Fruits are typically affected at an early stage or shortly after the time of shuck fall, the critical period for russet development extending for about 1 mo. thereafter. When about three-fourths grown, the prunes apparently become highly resistant. Russet is definitely nonparasitic in nature and appears to be due principally to mechanical injury from the rubbing of twigs, etc., against the young fruits during windy periods. Pruning and suitable windbreaks are suggested as possible methods of reducing the incidence and severity of the injury.

Immunological studies on the three peach diseases, yellows, rosette, and little peach, L. O. Kunkel (*Phytopathology, 26 (1936), No. 3, pp. 201–219, figs. 6*).—In experiments designed to show whether trees affected by any one of the three peach viruses—yellows, rosette, or little peach—would acquire immunity from either of the other two, trees with little peach proved immune to yellows, and trees with yellows immune to little peach. Neither yellows nor little peach trees were immune to rosette. Yellows buds transplanted to little peach trees produced shoots with typical little peach, and little peach buds transplanted to yellows trees shoots with typical yellows. Subinoculations from these shoots transmitted the disease carried by the tree on which the bud was transplanted. Trees inoculated simultaneously with little peach and yellows buds at different levels of their stems contracted the disease carried by the bud in the

upper position. Shoots from the lower bud bore symptoms of, and transmitted, the disease carried by the upper bud.

These results are held to indicate that little peach and yellows are strains of the same disease, that both are distinct from rosette, and that the point of inoculation determines whether yellows or little peach shall prevail in any given tree.

Further studies on zinc sulfate in peach sprays, with limited tests in apple sprays, K. J. KADOW and H. W. ANDERSON (*Illinois Sta. Bul. 424 (1936), pp. 129–144*).—Terminating this 7-yr. study, the following conclusions are drawn in addition to the confirmation of results previously noted (E. S. R., 73, p. 496):

Small amounts of zinc sulfate ($ZnSO_4$) appeared to be as efficient as larger amounts in reducing water-soluble arsenic in peach sprays consisting of acid lead arsenate and hydrated lime or of mixtures of acid lead arsenate and calcium carbonate. Under average field conditions, 1 lb. in 100 gal. of water, with 3 lb. of acid lead arsenate and 3 lb. of hydrated lime, was apparently sufficient to reduce spray injury effectively. With $ZnSO_4$ in apple sprays at 8 lb. to 100 gal. of water plus acid lead arsenate and lime, or with from 4- to 5-lb. applications of $CuSO_4$ in bordeaux mixture, russet resulted on Ben Davis apples. The effects of small amounts of $ZnSO_4$ on apples was not determined. Data on the insecticidal value of $ZnSO_4$ have not been conclusive, but apparently it has no marked influence on codling moth control.

The results obtained preclude the recommendation of $ZnSO_4$ as a fungicide in peach or apple sprays. In laboratory tests it proved much more toxic to apple scab (*Venturia inaequalis*) than to brown rot (*Sclerotinia fructicola*), but under field conditions it was only 65 percent effective against apple scab. No significant data were obtained relative to its control of brown rot, but laboratory tests would indicate very little value in this respect. From two to three lead arsenate-lime sprays for curculio, with or without $ZnSO_4$, are usually sufficient to control peach scab in Illinois, but acid lead arsenate and lime should never be applied to peaches under field conditions in the State without adding $ZnSO_4$.

Zinc sulfate was not observed to impart any "stimulating effect" to the peach under Illinois field conditions.

A study of the toxic action on gray-mold spores of cleaning solutions used in spray residue removal, O. F. SCHNELLHARDT and F. D. HEALD (*Phytopathology, 26 (1936), No. 6, pp. 564–577, figs. 2*).—Washing tanks for removal of spray residue are one of the main sources of contamination of apples with gray mold (*Botrytis cinerea*). The cleaning solutions commonly used for spray residue removal are, however, toxic to gray mold spores and consequently reduce the load of viable spores. Of the three cleaners used in these tests at the Washington Experiment Station, sodium silicate was most toxic, hydrochloric acid less so, and sodium carbonate of least effect. The temperature of cleaning solutions affected their toxicity, the kill being progressively increased from 90° to 120° F.

The control of raspberry mosaics, L. M. COOLEY (*N. Y. State Hort. Soc. Proc., 81 (1936), pp. 277, 278*).—In this note from the New York State Experiment Station, the control measures outlined advocate the use of resistant varieties or of healthy stock combined with isolation and roguing. These diseases are reported to present the most serious problem for small fruits in the Hudson Valley.

The Phytophthora disease of strawberry, I, II (*Sci. Hort. [Wye, Kent, Eng.], 4 (1936), pp. 52–58*).—The following two sections are included:

I. *Pathological investigations,* N. L. Alcock (pp. 52–56).—The symptoms and successful inoculation tests, using diseased roots containing oospores of the

Phytophthora, are described. Some thousands of attempts at cultivation of the fungus, carried out by the author and others, have thus far failed, but a tentative life history is outlined. Nine yr. of study in the laboratory and field have indicated the etiological relations and virulence of the disease and its ready transmission by affected plants.

Experiments in control have thus far given disappointing results, but certain general suggestions are given and the possibility of developing resistant varieties is pointed out.

II. *The Phytophthora disease in the field*, D. V. Howells (pp. 50–58).—The history and incidence of the disease in Scotland are briefly outlined, and its transmission (largely by infected plants) and course in the field are discussed. Four epidemics (the first in 1921), as outlined, illustrate the more important practical aspects of the disease.

A method of harvesting grapefruit to retard stem-end rot, J. R. Winston (*U. S. Dept. Agr. Circ. 396 (1936), pp. 8, figs. 6*).—Except when very ripe, pulled grapefruits proved to be less rapidly affected by stem-end rot than when clipped. Borax treatment at the packing house was very effective in further reducing both stem-end rot and blue mold. Pulling is especially recommended for fruit intended for storage or export.

Effects of storage and holding conditions on Alternaria in lemons, H. S. Fawcett, L. J. Klotz, and H. W. Nixon (*Calif. Citrogr., 21 (1936), No. 4, pp. 118, 143, 144, figs. 2*).—Since *Alternaria* decay often causes serious losses in lemons held in cold storage, an experiment was conducted (1935) by the California Citrus Experiment Station in cooperation with the Fruit Growers' Exchange. The results indicated that lemons from the air-conditioned, refrigerated storage room (lot A) were superior in keeping quality to those from the naturally ventilated one (lot B). After removal and placement in cabinets held at various temperatures, the lemons of lot A continued to show a greater resistance to *Alternaria* than those of lot B. The greater resistance to break-down was considered as due to the more constant temperature and humidity and to the smaller accumulation of deleterious substances, as indicated by the lower concentration of carbon dioxide in the air-conditioned room. From 59° F. upward lot B showed a rapid increase in the fungus and in indications of its presence, while lot A did not do so until a temperature of 65° was attained. The greater amount of *Alternaria* in lot B was correlated with a much higher percentage of black buttons after 6 months' storage.

The condition of the fruit when taken from storage thus appears to be a reliable indication of its later keeping quality.

Bark disease of Tahiti lime and Perrine lemon, W. B. Tisdale (*Florida Sta. Press Bul. 481 (1935), pp. 2*).—This is a semipopular account of a bark disease due to *Diplodia* and *Phomopsis*, and of suggested control measures.

Investigations of Nectria diseases in hardwoods of New England, P. Spaulding, T. J. Grant, and T. T. Ayers (*Jour. Forestry, 34 (1936), No. 2, pp. 169–179, fig. 1*).—It is concluded from this study that in silvicultural work *Nectria*-cankered trees should be used for cordwood and the slash burned where economically feasible, and those left should be girdled or felled. Cankers occur even in sapling stands and should receive special attention. The consistent discrimination against *Nectria*-cankered trees throughout the life of a stand up to large pole size should control this disease effectively.

Moisture is a strong factor in relation to *Nectria* fruiting, but its practical importance cannot yet be evaluated.

Red maple, sweet birch, and yellow birch are most often cankered, while white ash, white oak, scarlet oak, and American elm are not commonly affected in New England. Cross inoculations indicated that canker-forming Nectrias

go freely from one hardwood species to most others, and the fact that weed species such as mountain maple and striped maple harbor these fungi gives an additional reason for removing them from hardwood stands when practicable.

The beech *Cryptococcus-Nectria* disease of south-central and eastern Maine is due to a complex of injury by the insect and of fungus attack in the injured bark, causing death in severely affected trees. Diseased trees were also found infected by *Nectria* spp. other than the one commonly associated with this insect.

Cedar rust and its control in the Hudson Valley, J. M. HAMILTON (*N. Y. State Hort. Soc. Proc., 81 (1936), pp. 216–221*).—In this contribution by the New York State Experiment Station, it is stated that cedar rust on apple trees has been increasingly destructive in this region, *Gymnosporangium juniperi-virginianae, G. globosum*, and *G. germinale* or *G. clavipes* all being concerned. The distribution, symptoms, other hosts, and the relations of climatic factors as studied under the local conditions are briefly described, together with a combined spray schedule for both scab and rust.

New facts concerning Cephalosporium wilt of elms, D. B. CREAGER (*Jour. Arnold Arboretum, 16 (1935), No. 4, pp. 453, 454*).—Attention is called to two kinds of reproductive bodies—naked spore heads and pycnidia. The latter, a new type of fructification for *Cephalosporium*, produce abundant spores which remain viable over winter. Wounds in the leaves provide the most common infection court for mycelium or either type of spore, and a yellowing around this court is an early symptom of typical leaf infection.

The results of preliminary tests for control by eradication and by fungicides and insecticides are briefly noted.

A heart rot of magnolia caused by Fomes geotropus, H. W. JOHNSON and C. W. EDGERTON (*Mycologia, 28 (1936), No. 3, pp. 292–295, fig. 1*).—In this study from the Louisiana State University, *F. geotropus* was found constantly associated with and evidently the cause of, a heart rot of *Magnolia grandiflora*. It appears to be responsible for the destruction of many of the old trees in southern Louisiana, and to be the first record of this fungus attacking the species.

Maple wilt, F. C. STRONG (*Michigan Sta. Quart. Bul., 18 (1936), No. 4, pp. 225–227*).—The symptoms of *Verticillium* attack are described. In early stages of the disease, fertilization of the trees with ample watering when necessary is reported to have resulted in good growth and disappearance of symptoms. It is not known how permanent these results may prove to be. Removal is advised for badly affected trees. In replanting, avoidance of the susceptible Norway maple, hard maple, American elm, and Japanese barberry is recommended.

Pathogenicity and cultural experiments with Caliciopsis pinea, W. W. RAY (*Mycologia, 28 (1936), No. 3, pp. 201–208, figs. 6*).—In this investigation from Cornell University, inoculations with mycelium and spores from pure cultures indicated that *C. pinea* is parasitic for white pine, causing sharply delimited cankers on the trunk and branches. Spermagonia and mature stromatic columns containing asci and spores were developed in culture.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Planning for wildlife in the United States (*Natl. Resources Bd., Land Planning Com. Sup. Rpt., 1935, pt. 9, pp. V+24, figs. 2*).—Section 1 of this supplementary report (pp. 1–11) deals with the requirements for wildlife areas, section 2 (pp. 12–14) with policies with respect to wildlife, and section 3 (pp. 15–24) with wildlife management in national forests. The report was prepared

under the direction of a committee of eight, with M. L. Wilson serving as chairman and L. C. Gray as director, the first two sections being contributed by the U. S. D. A. Bureau of Biological Survey and the third by the Forest Service.

Forest wildlife census methods applicable to New England conditions, N. W. HOSLEY ET AL. (*Jour. Forestry, 34 (1936), No 5, pp. 467–471*).—This is a report of the New England Section Subcommittee on Fish and Game Management.

Natural history of vertebrates (except birds): A laboratory and field guide, F. N. BLANCHARD (*Ann Arbor, Mich.: Edwards Bros., 1935, rev., pp. II+82, fig. 1*).—This is a revised edition of a photolithoprint reproduction of a manuscript, the first edition of which appeared in 1932. Following the introductory account, which includes a list of equipment needed, directions on collecting and preserving animals, and special problems, mammals (pp. 6–30), amphibians (pp. 31–51), reptiles (pp. 52–70), and fishes (pp. 71–82), respectively, are considered, a rather complete list of references accompanying each.

Deer and dauerwald in Germany, I, II, A. LEOPOLD (*Jour. Forestry, 34 (1936), Nos. 4, pp. 366–375, figs. 5; 5, pp. 460–466*).—Part 1 of this contribution deals with history and part 2 with ecology and policy.

The Capillariinae parasites of mammals (Nematoda: Trichuroidea) [trans. title], J. F. TEIXEIRA DE FREITAS and H. LENT (*Mem. Inst. Oswaldo Cruz, 31 (1936), No. 1, pp. 85–160, pls. 16*).—The synonymy, descriptions, habitat, and geographical distribution of 33 well known and 24 insufficiently known species of the genus *Capillaria* parasitic in mammals is followed by a systematic host list and a bibliography of 21 pages.

The parasites of some North Carolina rodents, R. HARKEMA (*Ecol. Monog., 6 (1936), No 2, pp. 151–232, figs. 5*).—In the introductory part of this contribution the author deals with previous work, materials and methods, and hosts examined. A systematic list is given of the parasites which infested these hosts (pp. 157–160), followed by a summary of the findings also arranged in systematic order, their seasonal variation and infestation being discussed and graphically illustrated (pp. 161–177). A list of the ecto- and endo-parasites that have been reported from North American Rodentia and Lagomorpha, with their hosts, arranged alphabetically by systematic groups (pp. 177–218) follows. Under the name *Syphacia peromysci* n. sp., a description is given in an appendix of a nematode from the white-footed mouse, together with a bibliography of 12 pages.

Choice of rat poison in antiplague work, J. D. LONG (*Pub. Health Rpts. [U. S.], 51 (1936), No. 18, pp. 551–554*).—Antiplague control work with the rat in South America during the last 6 yr. is said to have demonstrated arsenic to be the most satisfactory treatment, it being cheap and always well taken by the rats if care be taken to make the vehicle attractive. It is sufficiently slow in action to allow the rodent to leave and prevent the release of infected fleas within the inhabited premises.

The northern bob-white's winter territory, P. L. ERRINGTON and F. N. HAMERSTROM, JR. (*Iowa Sta. Res. Bul. 201 (1936), pp. 301–443, figs. 26*).—The several parts of this work are devoted to introductory remarks and technic (pp. 305–333), survival data (pp. 333–365), analysis of carrying capacity (pp. 366–405), and management of the bobwhite's winter territory (pp. 405–437). It is based upon the data from intensive population studies which have been carried on over a period of six winters, largely in Iowa and Wisconsin agricultural communities, accounts relating to which have been noted (E. S. R., 75, p. 373).

Direct enumeration census technic was found to be the most useful and reliable in the field researches. "Survival data from the 70 specific bobwhite wintering territories or groups which have been studied for more than one

season indicate that a given tract of environment is capable of accommodating a rather definitely limited population even under optimum weather conditions. The carrying capacity of a tract of land for bobwhites seems generally to remain about the same from one year to the next, although the carrying capacity of each tract of land is by no means the same. Constancy of carrying capacity has been much more apparent on large land units than on small. Carrying capacity of quail environment doubtless changes gradually over a period of years, despite the fact that on our chief observational areas it has remained practically constant for as long as 6 yr. . . .

"The correlation between severity of predation upon wintering bobwhites and carrying capacity of their environment is especially significant. Losses from simple predation suffered by wintering populations within the carrying capacity of their environment, as measured to date, have been uniformly light, rarely at a rate exceeding 6 percent per 90 days. . . .

"On the whole, our evidence indicates that the pressure of native enemies is unlikely to be sufficiently severe to reduce healthy, well-fed wintering bobwhite populations below the carrying capacity of the land. Populations may be reduced below carrying capacity, however, by shooting or trapping, by starvation or other emergencies associated with snow or ice storms, by drought, and probably by disease and unknown factors. Concentrations of the exotic ring-necked pheasant in coverts of strategic importance for quail may cause the latter to avoid those coverts, and may thus in effect lower the carrying capacity of the land for the quail themselves."

A list of 77 references to the literature is included.

Quail breeding manual (*New York: More Game Birds in Amer., 1935, rev. ed., pp. 55, figs. 36*).—This manual presents information on the care of quail breeders during the laying season; care and handling of quail eggs; hatching with Bantam hens and in the incubator; brooding of quail chicks with Bantam hens; rearing in the colony brooder house, the Coleman brooder, and in wire-bottomed growing pens; etc.

Venomous animals of Costa Rica: Intestinal parasites of animals, C. VÍQUEZ (*Animales venenosos de Costa Rica: Parásitos intestinales de nuestros animales. San José: Govt., 1935, pp. IV+5–318, figs.* [83]).—A practical, illustrated account of the poisonous animals, particularly reptiles, met with in Costa Rica is followed by notes on the endoparasites encountered (pp. 159–210), biological chemistry, hematology, etc.

Schistosome dermatitis in Canada: Notes on two causative agents and their snail hosts in Manitoba, W. E. SWALES (*Canad. Jour. Res., 14 (1936), No. 1, Sect. D, pp. 6–10, pl. 1*).—An investigation of "swimmers' itch" at Clear Lake, Manitoba, is said to have revealed the presence of two schistosome cercariae, *Cercaria elvae* Miller 1923 in the snail *Limnea stagnalis jugularis* Say and *Cercaria* sp. in *Stagnicola emarginata canadensis* (Sowerby), both known to cause dermatitis.

Earthworms of Missouri, H. W. OLSON (*Ohio Jour. Sci., 36 (1936), No. 2, pp. 102–113*).—This contribution, based upon personal collections which have extended into 25 counties of the State during a period of 4 yr., presents descriptions and a key for the separation of the 17 forms met with in Missouri.

The pioneer century of American entomology, H. B. WEISS (*New Brunswick, N. J.: Author, 1936, pp.* [3]+320).—This work, in mimeographed form, in which the author traces the record of entomology from its beginning in North America down to the year 1865, deals with the subject in 12 chapters, as follows: Entomology in the accounts of early travelers (1588–1723) (pp. 3–21); the entomology of early books and papers (1731–1800) (pp. 22–57); the early years of the nineteenth century (1800–1817) (pp. 58–86); Thomas Say and his

contemporaries (1817–31) (pp. 87–120); from Zimmerman to Le Conte (1832–45) (pp. 121–163); Asa Fitch and other entomologists (1845–54) (pp. 164–201); the Glover and Osten-Sacken period (1855–60) (pp. 202–233); from Walsh to Cowan (1860–65) (pp. 234–260): the entomology in agricultural periodicals before 1865 (pp. 261–273); scientific societies, scientific journals, and exploring expeditions contributing to the progress of American entomology (pp. 274–286); some notes on Canada (pp. 287–301); and entomology in Europe during the pioneer century in America (pp. 302–309).

A bibliography of 25 references and an index are included.

A résumé of insect conditions in Florida in 1935 and some pointers for 1936, J. R. WATSON (*Citrus Indus., 17 (1936), No. 2, pp. 13, 14*).—A practical contribution from the Florida Experiment Station.

[Report of work in economic zoology and entomology by the Indiana Station] (*Indiana Sta. Rpt. 1935, pp. 33–37, 42, 43, figs. 2*).—The work of the year referred to (E. S. R., 73, p. 205) includes data on the European corn borer; control of the potato leafhopper, tarnished plant bug, striped cucumber beetle, and cabbage looper; oriental fruit moth; codling moth insecticide tests, timing sprays, screening packing houses, chemically treated bands, cavity fillers, orchard sanitation through burning of the floor cover, and the use of lights in trapping moths; the Japanese beetle; and quail studies.

Insectae Borinquenses: A revised annotated check-list of the insects of Puerto Rico, G. N. WOLCOTT; **A host-plant index**, J. I. OTERO (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 20 (1936), No. 1, pp. 627, figs. 192*).—A revision is presented by Wolcott of the annotated check list of the insects of Puerto Rico previously noted (E. S. R., 53, p. 51), which includes a host plant index to Insectae Borinquenses, by Otero (pp. 601–627).

[Report of work in entomology by the Tennessee Station], S. MARCOVITCH (*Tennessee Sta. Rpt. 1934, pp. 24–27*).—The progress of work during the year (E. S. R., 73, p. 205) with the melon aphid, cutworms, bean and cowpea weevils, and tobacco insects is briefly referred to, and reference is made to the more important insects of the year.

[Contributions on economic insects in Quebec] (*Quebec Soc. Protect. Plants Ann. Rpt., 27 (1934–35), pp. 46–49, 57–65, 84–105, fig. 1*).—The following contributions are presented: Some Outstanding Entomological Events of 1934, by G. Maheux (pp. 46–49); The Asparagus Beetles, by J. I. Beaulne (pp. 57–60); The Number of Larval Instars of *Dendroctonus piceaperda* Hopk. as Determined by Dyar's Rule, by A. R. Gobeil (pp. 60–65); Wireworm Survey in Tobacco Fields of the Yamaska Valley (Preliminary Report), by R. Bordeleau (pp. 84–87); The Entomological Record, 1934, by W. J. Brown (pp. 87–95); and A Preliminary List of Insects of the Province of Quebec—Part IV, The Odonata, by E. M. Walker (pp. 96–105).

Miscellaneous physiological observations on the laboratory breeding of flesh flies and of Melanoplus bivittatus Say, A. W. A. BROWN (*Canad. Ent., 68 (1936), No. 4, pp. 88–91*).—These observations relate to three blowflies, *Wohlfahrtia vigil* Wlk., *Calliphora erythrocephala* Mg., and *Lucilia sericata* Mg. The two-striped grasshopper was reared in large numbers by the author from egg to maturity on a diet of whole lettuce heads alone.

Report of the Government entomologist, W. H. EDWARDS (*Jamaica Dept. Agr. Ann. Rpt., 1934, pp. 24–28*).—The occurrence of and work of the year with the more important insect enemies of sugarcane (particularly the sugarcane moth borer), citrus, banana, and other crops are briefly reported upon. Reference is made to the heavy infestation of Bombay mangoes by the fruitfly *Anastrepha longimacul* Greene.

Annual report for 1935 of the zoologist, C. WARBURTON (*Jour. Roy. Agr. Soc. England, 96 (1935), pp. 499–506, figs. 3*).—In this report a brief reference is made to some of the insect and related pests which have proved destructive to crops in England during 1935.

[Contributions on economic insects and insecticides] (*East Malling [Kent] Res. Sta. Ann. Rpt., 20 (1932), pp. 109–140, pls. 6; 21 (1933), pp. 176–242, 256–258, pl. 1, figs. 7*).—These resports (E. S. R., 68, p. 66) include the following contributions: Notes on Insect Pests and Mites in 1932 (pp. 109–116) and Further Observations on the Strawberry Tarsonemid Mite *Tarsonemus fragariae* Zimm. (pp. 117–131) (E. S. R., 66, p. 354), both by A. M. Massee; Two Apple Capsid [*Plesiocoris rugicollis* Fall.] Spraying Trials and Some Notes on Spray Damage, by W. Steer (pp. 132–140); Notes on Mite and Insect Pests for the Year 1933 (pp. 176–180) and Investigations on the Control of the Strawberry Tarsonemid Mite [*Tarsonemus fragariae* Zimm.] (pp. 181–187), both by A. M. Massee; Studies on *Byturus tomentosus* Fabr.—IV, 1933 Experiments on the Control of the Raspberry and Loganberry Beetle, by W. Steer (pp. 188–196) (E. S. R., 68, p. 648); Experiments on the Control of the Apple Sawfly *Hoplocampa testudinea* Klug.; The Results of One Season's Field Trials and Some Considerations Arising From Them, by G. L. Hey and W. Steer (pp. 197–216); An Experiment on the Control of the Apple Blossom Weevil *Anthonomus pomorum* (L.) Curt. by Means of a Derris Dust, by G. L. Hey, A. M. Massee, and W. Steer (pp. 217–219); A Progress Report on the Causes of Immunity to the Apple Woolly Aphis (*Eriosoma lanigerum* Hausmann), by R. M. Greenslade, A. M. Massee, and W. A. Roach (pp. 220–224); Some Notes on the Woolly [Apple] Aphis Parasite *Aphelinus mali* Hald., by R. M. Greenslade and A. M. Massee (pp. 225–227); Tortrix Investigations in 1933 (pp. 228–230) and Observations on the Effects of Various Gas Mixtures of Known Composition on Tortrix Larvae in Store (pp. 231–233), both by G. L. Hey and A. M. Massee; Miscellaneous Observations on Apple Sawfly (*Hoplocampa testudinea* Klug.) in 1933, by G. L. Hey and W. Steer (pp. 234–242); The Warm Water Treatment of Strawberry Plants, by A. M. Massee (pp. 256, 257); and Apple Sawfly [*Hoplocampa testudinea* Klug.]: Some Suggestions for Control Measures, by G. L. Hey, M. H. Moore, and W. Steer (p. 258).

The report for 1934 has been noted (E. S. R., 73, p. 643).

Insects injurious to cultivated plants: Their biology and control, II, A. BALACHOWSKY and L. MESNIL (*Les Insectes nuisibles aux plantes cultivées: Leurs moeurs, leur destruction. Paris: Étab. Busson, 1936, vol. 2, pp. XI+1139–1921, pl. 1, figs. 385*).—This second volume, which completes the work (E. S. R., 74, p. 367), takes up insect enemies of vegetable crops, forage legumes, and the Salicaceae, including willow, osier, and poplar (pp. 1141–1457); insects injurious to outdoor ornamental and decorative plants and greenhouse crops (pp. 1461–1620); polyphagous insect enemies of plant crops (pp. 1623–1710); insects injurious to stored grain and grain products (pp. 1713–1754); and insecticides (pp. 1757–1861). A bibliography (pp. 1865–1892) and a general index to the two volumes (pp. 1895–1921) are included.

[Contributions on economic insects] (*Rev. Path. Vég. et Ent. Agr. France, 22 (1935), No. 4, pp. 255–302, figs. 8*).—The Coccidae of Spain are dealt with by A. Balachowsky (pp. 255–269); the Coccidae of Morocco, by C. Rungs (pp. 270–283); observations on the spreading capacity of insecticide sprays, by J. de Francolini (pp. 284–287); the value of vegetable dusts in combating the Colorado potato beetle, by F. Robin (pp. 288–297); and the effect of arsenicals on the larvae of *Hyponomeuta padella*, by B. Trouvelot and M. Raucourt (pp. 298–302).

Entomological work, E. HARGREAVES (*Sierra Leone Dept. Agr. Ann. Rpt., 1934, pp. 16–18*).—The occurrence of and control work with economic insects during the year are briefly reported (E. S. R., 70, p. 61).

Report of the Government entomologist for 1934, H. HARGREAVES (*Uganda Dept. Agr. Ann. Rpt., 1934, pt. 2, pp. 62–72*).—The occurrence of and work of the year with important insect pests, particularly the resistance of cotton varieties to jassid bugs (*Empoasca* spp.), are reported (E. S. R., 72, p. 655).

Entomological investigations, G. A. JULIUS ET AL. (*Austral. Council Sci. and Indus. Res. Ann. Rpt., 9 (1935), pp. 28–34*).—The progress of investigational work with economic insects in 1934–35 (E. S. R., 73, p. 645) is reported upon.

[Report of work in entomology], A. F. BELL (*Queensland Bur. Sugar Expt. Stas. Ann. Rpt., 35 (1935), pp. 48–53*).—The occurrence of and work of the year with sugarcane insects in Queensland, particularly the grayback beetle (*Lepidoderma albohirtum* Waterh.) and the beetle borer, officially known as the New Guinea sugarcane weevil, are reported upon. The introduction of the giant toad (*Bufo marinus* L) from Hawaii, 102 in number, and their liberation at Meringa during the year is referred to.

Leaf miner and stem borer of tobacco in north Queensland, D. O. ATHERTON (*Queensland Agr. Jour., 45 (1936), Nos. 1, pp. 12–31, pl. 1, figs. 6; 2, pp. 131–145, figs. 7; 3, pp. 239–248; 4, pp. 331–344*).—This contribution relates to the potato tuber worm and the stem borer *Phthorimaea heliopa* Low., two of the most important enemies of tobacco in Queensland, their natural enemies, and means of control. A list of 59 references to the literature is included.

Injurious fruit insects during the past year, P. J. CHAPMAN (*N. Y. State Hort. Soc. Proc., 81 (1936), pp. 7–12*).—A practical contribution from the New York State Experiment Station on the status of injurious fruit insects in 1935.

[Contributions on apple insect control] (*Ill. State Hort. Soc. Trans., 69 (1935), pp. 167–199, 285, 286, 485–494*).—Contributions presented at the annual meeting of the society held at Decatur, Ill., in December 1935 (E. S. R., 73, p. 348) include the following: The Use of Nicotine in the Apple Spray Schedule, by W. P. Flint and M. D. Farrar (pp. 167–173), from the Illinois Experiment Station; The Spray Residue Situation, by W. A. Ruth and V. W. Kelly (pp. 174–188), with a Brief Summary of Some of the More Important New Experiments, by W. A. Ruth and D. S. Brown (pp. 186–188); A Grower's Results in Removing the Lead and Arsenical Load, by C. T. Smith (pp. 189–195); Apple Insect Control in Northern Illinois During 1935, by L. H. Shropshire (pp. 285, 286); and The Latest Methods of Fighting the Oriental Fruit Moth, by S. C. Chandler and W. P. Flint (pp. 485–492), from the Illinois Experiment Station.

Some insect problems of the small fruits, O. H. HAMMER (*N. Y. State Hort. Soc. Proc., 81 (1936), pp. 279–283*).—This is a practical contribution from the New York State Experiment Station, dealing with some of the more important currant, raspberry, and strawberry insects.

Observations on some insect enemies of the coffee tree [trans. title], J. V. LEROY (*Inst. Natl. Étude Agron. Congo Belge Pubs., Sér. Sci., No. 8 (1936), pp. 30, figs. 9*).—The pests here considered include leaf rolling moths of the genus *Epicampoptera*, particularly *E. marantica;* the coffee leaf miner (*Leucoptera coffeella* Guer.); the coffee berry beetle borer (*Stephanoderes hampei* Ferr.); and the coffee mealybug (*Pseudococcus lilacinus* Ckll.).

[Insect pests of lac host trees], P. M. GLOVER (*Indian Lac Res. Inst. Ann. Rpt., 1934–35, pp. 14–25*).—A brief account is given of the insects, particularly *Aspidiotus orientalis* Newst, attacking lac host trees, which, in the order of

severity attacked by *A. orientalis*, are *Zizyphus jujuba*, *Schleichera trijuga*, *Z. xylopyra*, and *Butea frondosa*. Observations of the predatory and parasitic enemies of lac and on control measures, both artificial and biological, follow. A brief account of the bionomics of *Laccifer lacca* (Kerr) is included.

Insects in aeroplanes: A brief report and suggestions, C. B. SYMES (*Kenya [Med. Dept.], Rec. Med. Res. Lab., No. 6 (1935), pp. 16, figs. 4; abs. in Rev. Appl. Ent., 24 (1936), Ser. B, No. 4, pp. 65, 66*).—Data and suggestions are given on some of the insect problems created in Kenya by air travel. After recording the distribution of the yellow-fever mosquito in Kenya, Uganda, and the Anglo-Egyptian Sudan, and of mosquitoes that have transferred yellow fever experimentally, tables are given which show the number of insects of different kinds caught in airplanes examined at Kisumu and Nairobi during various periods in 1933 and 1934 and in the hangar at Kisumu during the early part of 1934. In reference to control measures, it is pointed out that in spite of routine spraying of airplanes at various airports, insects are still being carried in serious numbers. Complete fumigation of an airplane with hydrocyanic acid gas can be carried out in 2 hr. or less with little if any inconvenience to traffic, but it is necessary to provide an effective means of dispersing the gas quickly and completely after fumigation. Promising results were obtained in two experiments carried out to test the efficacy for this purpose of an air blower consisting essentially of a large fan driven by a motorcycle engine to which was attached 30 ft. of canvas hose with a tin nozzle. Although fumigation will kill all insects in the airplane at the time, it will not prevent reinfestation, and should therefore be carried out as near the time of departure as possible. The airplanes should be made insect-proof and provided with insect-proof doors and windows that can be kept closed while in the airport. It is suggested that it be made compulsory to give warning of the intended arrival of aircraft (other than those regularly using airports), so that measures can be taken by health authorities to ascertain whether they are likely to be concerned in disease transmission.

Studies on the supercooling death of insects, K. SHIBATA (*Mem. Faculty Sci. and Agr., Taihoku Imp. Univ., 16 (1935), No. 2, pp. 91–103*).—This contribution, presented with a list of 11 references to the literature, deals with experimental work on the cold-death of the fruitfly *Chaetodacus cucurbitae* Coq., from which the conclusion is drawn that there are two cause groups, namely, freezing death and supercooling death.

"When the insects are exposed to low temperatures below the freezing point of their body fluid, they do not always freeze immediately but remain in a supercooling state, if the conditions of cooling are such as to keep them at a still state without being given mechanical shocks or such as to keep the rate of cooling slow. . . .

"The mechanism of death in the supercooling state is believed to be quite different from that due to freezing, for the time required to kill the insects from supercooling is far longer than that from freezing. All the larvae of a fruitfly, *C. cucurbitae*, are killed in 25 min. exposure when they are completely frozen at —3.4° C., in 20 min. at —5°, and in only 4 min. at —12°. On the contrary, as long as 16 hr. is necessary to kill them from supercooling at —3.4°, 8 hr. at —5°, and 2 hr. at —12°."

Studies on the death-temperature of a fruit-fly, Chaetodacus cucurbitae Coquillett, at the frozen state and the influence of supercooling upon its temperature, K. SHIBATA (*Mem. Faculty Sci. and Agr., Taihoku Imp. Univ., 16 (1935), No. 2, pp. 105–116, figs. 2*).—In the work reported it is shown that the body temperature of the fruitfly *C. cucurbitae* at which 100 percent mortality is produced owing to the freezing of the body fluid lies lower than —3.6° C.

(+25.2° F.). The depth of the supercooling as well as its duration has a marked effect upon the freezing death of the insect; that is, the deeper or the longer the supercooling, the higher is the death temperature of the fly.

The development of biological control of insect pests, with special reference to some current experiments, W. F. JEPSON (*Rev. Agr. Mauritius, Nos. 84 (1935), pp. 188–192; 85 (1936), pp. 29–34*).—The status of biological control work with insect pests is reported upon.

Choosing a spray program, P. J. PARROTT (*N. Y. State Hort. Soc. Proc., 81 (1936), pp. 18–26*).—This is a practical contribution from the New York State Experiment Station.

Insect control (*Rhode Island Sta. Rpt. [1935], p. 12*).—Reference is made to a comparison of insecticides for control of the cabbage root maggot.

The temperature and humidity relations of the cockroach.—IV, Thermal deathpoint, D. L. GUNN and F. B. NOTLEY (*Jour. Expt. Biol., 13 (1936), No. 1, pp. 28–34, figs. 4*).—In continuing earlier work (E. S. R., 73, p. 648), the thermal death points of three species of cockroaches in dry and in moist air have been determined for 1-day and 1-hr. exposures. Moist air has been found to be "more favorable than dry in the longer exposures, because in dry air death occurs from desiccation when the temperature itself is not fatal. Dry air is more favorable than moist in the shorter exposures, owing to the fact that the evaporation of water lowers the body temperature. Bearing in mind the thermotactic behavior of these animals, these observations would seem to have little ecological importance."

A general investigation of locust outbreaks in China during the year 1934, F. C. Woo and T. S. CHENG ([*China*] *Natl. Agr. Res. Bur. Spec. Pub. 10 (1935), pp. 32, pl. 1, figs. 4; Eng. abs., pp. 31, 32*).—A compilation of reports from seven provinces represented at a conference in the interest of grasshopper control, received every 10 days from the time of the meeting in early June until November, is here presented. The account relates to the two principal species of migratory grasshoppers in 1934, namely, the so-called migratory locust *Locusta migratoria* L. and the bamboo locust *Ceracris kiangsu* Tsai, with information on prevalence, damage, control measures, etc.

A general investigation of the locust (Locusta migratoria L.) outbreaks in China during the year 1933, F. C. Woo and T. S. CHENG ([*China*] *Natl. Agr. Res. Bur. Spec. Pub. 5 (1934), pp. 42, figs. 6; Eng. abs., pp. 41, 42*).—Migratory grasshopper outbreaks in 265 hsiens in 9 provinces of China in 1933 are reported upon.

The apple thrips Thrips imaginis Bagnall in South Australia, J. DAVIDSON (*Jour. Dept. Agr. So. Austral., 39 (1936), No. 7, pp. 930–939, figs. 4*).—Following a brief introduction, a description is given of *T. imaginis*, its life history, food plants, fluctuations in numbers throughout the year, and control measures.

The gladiolus thrips—causes growers severe losses, N. S. NOBLE (*Agr. Gaz. N. S. Wales. 46 (1935), No. 12, pp. 681, 682, fig. 1*).—The gladiolus thrips, first recorded as a pest in New South Wales in 1932, is said to have caused severe injury to commercial gladiolus crops and private gardens.

Thrips attacking man, S. F. BAILEY (*Canad. Ent., 68 (1936), No. 5, pp. 95–98*).—The literature relating to the attack of man by thrips is briefly reviewed, and personal observations are referred to.

Frankliniella gossypiana, new name, J. D. HOOD (*Biol. Soc. Wash. Proc., 49 (1936), p. 68*).—The name *F. gossypiana* is proposed as a substitute for *Euthrips gossypii*, as *E. gossypii* has been used for quite a different insect occurring in Formosa. It is pointed out that this thrips is not restricted to cotton as a food plant.

The biological control of Clidemia hirta in Fiji, R. V. FYFE (*Jour. Austral. Inst. Agr. Sci., 2 (1936), No. 1, pp. 8, 9*).—The plant *C. hirta* was introduced into Fiji from British Guiana sometime prior to 1800 and became a major weed pest through invading permanent cultivations and native forests. It is said to have been checked by the combined effect of competing vegetation and a number of insect enemies, chief of which is the thrips *Liothrips urichi*, introduced from Trinidad and liberated on the island of Viti Levu, Fiji, in 1930.

Experimental studies on the influence of low temperatures upon the tropical bed-bug (Cimex hemipterus Fabricius), N. OHMORI (*Taiwan Igakkai Zasshi (Jour. Med. Assoc. Formosa), 35 (1936), No. 3, pp. 624–644, fig. 1; Eng. abs., pp. 642–644*).—This is a third report of experimental studies on the influence of low temperatures on the tropical bedbug *C. hemipterus*, conducted in the attempt to explain experimentally the geographical distribution of the pest.

The rôle of bedbugs (Cimex lectularius L.) in transmission and preservation of tularaemia virus, V. P. BOZHENKO (BOGENKO) (*Vest. Mikrobiol., Épidemiol. i Parazitol. (Rev. Microbiol., Épidémiol. et Parasitol.), 14 (1935), No. 4, pp. 436–440; Eng. abs., p. 440*).—Transmission of tularemia by the bites of infected bedbugs was detected 15 hr. after the infecting feed. The virus was present in the bugs more than 6 mo., it having been recovered from feces of the infected insects. It remained virulent in the body of the bedbug for as long as 136 days after feeding.

Potato psyllid control, G. HARTMAN (*Wyoming Sta. Bul. 217 (1936), pp. 24, figs. 3*).—The results of a year's study of the potato psyllid *Paratrioza cockerelli* Sulc., which has caused heavy losses in potato production in Wyoming in the last few years, are reported.

In control work two applications of lime-sulfur solution at the right time have given larger net returns than one and as large or nearly as large as three. The best time of application appeared to be the early bloom stage for the first, and from 15 to 17 days later for the second. On dry land the lowest net return from two applications was $4.95 per acre and the highest $24.75. On irrigated land the lowest was $16.91 and the highest $32.89. When potato psyllids are present in a potato field, the use of lime-sulfur is profitable. The first spray should be applied at about the time the plants begin to bloom, followed 2 to 3 weeks later with a second application. Lime-sulfur sprayed on the vines using a pressure of 300 lb. per square inch gave better control than lower pressures.

"To date, there is no indication that the symptoms produced upon potatoes by the action of the psyllids are in any way carried from one season to the next by seed tubers from infested fields. The disease occurs only when psyllid nymphs are found upon the vines. . . .

"It appears now that spraying of potatoes for psyllid control is advisable and may become necessary for profitable potato production. The added cost of spraying will make it all the more necessary to give the utmost attention to all the factors which contribute to successful potato production. Such factors as land selection and preparation, the use of good seed, the proper planting date, better cultural methods, crop rotation, etc., must be carefully studied and practiced."

Stomach poisons such as zinc arsenite and lead arsenate may be mixed with the lime-sulfur solution for the control of chewing insects such as beetles and leafhoppers.

Transmission of sugarcane mosaic by the rusty plum aphid (Hysteroneura setariae), J. W. INGRAM and E. M. SUMMERS (*Jour. Agr. Res. [U. S.],*

52 (1936), No. 11, pp. 879–887).—In preliminary experiments commenced in Louisiana in 1933, here reported, the rusty plum aphid transferred mosaic to 24 of 419 healthy sugarcane plants. In parallel experiments, the corn leaf aphid transferred mosaic to 17 of 72 healthy plants. The rusty plum aphid has been found in the State feeding on sugarcane plants throughout the year, usually on the collar lobe, and is the most abundant of the aphids found on sugarcane in that State. It occurs on many different species of grasses growing in and around sugarcane fields, some of which are subject to mosaic. The green bug transferred the mosaic in two instances in preliminary trials.

Capitophorus aphids infesting Chrysothamnus, G. F. KNOWLTON and C. F. SMITH (*Canad. Ent., 68 (1936), No. 5, pp. 107–113, figs. 2*).—In this contribution from the Utah Experiment Station, 12 species are recorded as infesting rabbitbrush in western North America, of which 6 are described as new to science. A key for the identification of the aptera is included.

A primer for the aphid hunter, F. C. HOTTES (*Biol. Soc. Wash. Proc., 49 (1936), pp. 27–36*).—The technic employed in work with the Aphididae, including collecting equipment, habitat and manner of collection, manner of mounting for study and preservation, etc., is presented.

The symbionts of Pseudococcus brevipes in relation to a phytotoxic secretion of the insect, W. CARTER (*Phytopathology, 26 (1936), No. 2, pp. 176–183, figs. 2*).—This contribution from the Hawaiian Pineapple Canners' Experiment Station (E. S. R., 69, p. 829) reports upon studies of the relationship between the symbionts of the pineapple mealybug and the phytotoxic secretion of the insect responsible for green spotting of pineapple leaves. Colonies of this mealybug were transferred from pineapple to panicum grass (*Panicum barbinode*) and transferred back to pineapples after varying lengths of time.

"The effect of the colonies' feeding on the grass was to eliminate the green-spotting capacity of the mealybugs; continued growing of these colonies on pineapple has failed to restore this capacity. Coincident with the loss of the green-spotting capacity is the disappearance of the rodlike symbiont from the mycetome of the insect. The evidence is that this symbiont is pleomorphic and passes from a rod-shape to a coccus-rod form under the influence of radically changed nutrition. The rod-shape form is invariably present in green-spotting mealybugs, the coccus-rod in nongreen-spotting mealybugs. The fact that return of the mealybugs to pineapple does not result in the return of the capacity to produce green spots is proof that the loss of this capacity in the first instance is not due merely to a changed food plant, but to a radically changed physiology that is clearly associated with pleomorphism of the insect's symbionts."

Notes on Pseudococcinae of economic importance in Brazil, with descriptions of four new species [trans. title], E. J. HAMBLETON (*Arch. Inst. Biol. [São Paulo], 6 (1935), pp. 105–120, pls. 3, figs. 15; Eng. abs., p 119*).—Notes are given on the life history, occurrence, and host plants of 18 species of mealybugs from Brazil, several of which are serious pests in other parts of the world. *Pseudococcus magnoliae* on *Magnolia grandiflora* (Magnoliaceae), *P. mamabilis* on *Cupressus glauca* (Coniferae), *P. tibouchinae* on *Tibouchina mutabilis* (Melastomaceae), and *P. sociabilis* from *Hedera helix* (Araliaceae) and *Erythrina recticulata* (Leguminosae) are described as new to science.

The comparative insecticidal efficiency against the camphor scale of spray oils with different unsulphonatable residues, A. W. CRESSMAN and L. H. DAWSEY (*Jour. Agr. Res. [U. S.], 52 (1936), No. 11, pp 865–878, figs. 3*).—A report is given of a comparative study of the insecticidal value of three petroleum oils with 6, 16, and 33 percent by volume of sulfonatable material in laboratory and field spraying tests. The oils were applied in the form of emulsions containing from 0 9 to 2 percent of oil, sodium oleate soap being

used as the emulsifier, to camphor-tree plants and trees infested with the camphor scale. The other characteristics of the different oils were substantially the same, so that any detectable difference in scale mortality could be due only to differences in the sulfonatable portions.

Analyses of the oil deposits left by sprays showed that the deposits were independent of the sulfonatable content of the oil but varied directly with the oil content of the spray. When sprays which gave equal oil deposits were compared, the variations in insect mortality appeared to be entirely random, and no differences were found which could be attributed to the sulfonatable content of the oils.

Entomological investigations on the spike disease of sandal (26) Coccidae (Homopt.), N. C. CHATTERJEE and T. V. R. AYYAR (*Indian Forest Rec., n. ser., 1 (1936), No. 12, pp. [2]+233–242*).—Twelve species of Coccidae frequenting the foliage of sandal (*Santalum album* Linn.) in south India are listed. The results of field experiments are said to eliminate the Coccidae as possible disseminators of the spike disease. (See E. S. R., 75, p. 79.)

The control of the red scale in Palestine, M. H. SACHS (*Hadar, 8 (1935), Nos. 7, pp. 197, 198, 201–204; 8–9, pp. 234–240*).—It is concluded that spraying with lubricating oils is not an adequate means of control where the infestation is heavy, and that in heavy infestations of the red, black (Florida red), and mussel (purple) scales, only fumigation will be satisfactory, unless biological control is made effective.

The Florida wax-scale (Ceroplastes floridensis Comst.) in Palestine, F. S. BODENHEIMER (*Hadar. 8 (1935), No. 8–9, pp. 223, 224, 227, 228, figs. 2*).—A continuation of this contribution (E. S. R., 74, p. 669).

A study of codling moth collection and emergence, T. J. HEADLEE (*New Jersey Stas. Bul. 605 (1936). pp. 24, figs. 3*).—Continuous records of codling moth emergence at Glassboro, N. J., from the middle of the summer season of 1926 to the end of the summer season of 1935 are presented, of which the following interpretation has been made:

"Period from full bloom to codling moth emergence is so variable that it seems impracticable to use full bloom or blossom fall as a satisfactory datum point for dating sprays for control of codling moth. Because of the reasonably constant relation of date of maximum emergence (when one-half the total emergence has occurred) of moths to larval entry in apples, the date of maximum emergence is considered the best datum point from which to date cover sprays for control. Because of the time required for dissemination of recommendations to growers, the date of maximum emergence must be predicted from 1 to 2 weeks in advance for each climatically different area.

"These predictions are made by (1) plotting codling moth emergence observed at the codling moth emergence box station time and plotting temperature accumulations, also against time, at each temperature station, including the one located at the box station; (2) projecting the curve of codling moth emergence in its apparently normal direction to the calculated number, which is one-half of what will emerge, and noting the date; (3) projecting the curve of temperature accumulation at this same notation to the date of prediction for maximum emergence and noting the temperature accumulations on that date; (4) projecting the curves of the other temperature stations to a point where temperature accumulation is the same as that at the box station; (5) taking these dates as the date of maximum emergence in each case; [and] maintaining the bait pan records at the box stations and as an evaluation of the importance of the early emerging fringe.

"The variations of the total and partial length of codling moth brood are so large as to preclude their genesis from error and to indicate they are due to

environmental factors. The codling moth broods of different localities consist of a dominant group of the same length of cycle and of subsidiary groups having much shorter and much longer cycles. The dominant group gives the name of brood condition to the area. The codling moth is shown by these studies never to winter over in the pupal stage. Mortality in the emergence boxes is about 29.1 percent. About one-half the individuals that will emerge come out in the late summer and about one-half in the subsequent spring. Temperatures to which the codling moth larvae are subjected in the summer when they are collected do not appear to influence their emergence during the subsequent spring. The accumulation of the thermal constant, therefore, properly begins with January 1. Only a limited and almost negligible accumulation takes place prior to April 1."

New developments in summer oil sprays and their use for codling moth control, C. R. CLEVELAND (*Mich. State Hort. Soc. Ann. Rpt., 65 (1935), pp. 91–111*).—Tests in orchards in 1934 and 1935 (Kansas to Michigan), the details of which are given in tables, have shown that a combination of the commercial brand Superla Summer Spray Oil (one of the so-called new emulsible or soluble oils) with lead arsenate and lime can be used under average Michigan conditions as many as three times. The use of as much as 0.75 percent of Superla and lead arsenate 3 lb. and lime 3–5 lb. per 100 gal. in each application produces definite improvement in codling moth control without failing to meet the lead residue tolerance, if the fruit is washed at room temperature in low strength hydrochloric acid and modern underbrush machines such as are being installed at fruit exchanges are employed.

How the 1934 drouth affected the codling moth life cycle, M. H. SWENK (*Nebr. State Bd. Agr. Ann. Rpt., 1935, pp. 555–563, fig. 1*).—This report on an intensive study of the broods of the codling moth in southeastern Nebraska, with special reference to the responses of the insect to varying meteorological conditions, represents the seventh season in which the work has been conducted by the Nebraska Experiment Station. A diagram of the life history at Lincoln in 1934 is included.

Oriental fruit moth investigations in Ohio, II, R. B. NEISWANDER (*Ohio Sta. Bul. 569 (1936), pp. 30, figs. 7*).—This second contribution (E. S. R., 64, p. 362) reports upon biological studies (pp. 3–12), control studies with insecticides (pp. 13–17), parasites and their utilization in control (pp. 17–28), and the present status of the oriental fruit moth in Ohio (pp. 28, 29).

The time of emergence of spring brood oriental fruit moths was found to vary with the temperature but to correspond with the blooming period of the peach, both occurring successively later in a definite progression across the State from southern Ohio northward.

"In cultivated peach orchards in Ohio considerable numbers of both winter and summer cocoons have been found on the ground. Therefore orchards in which frequent cultivation is practiced have an advantage over those which are not tilled. On the other hand, the fact that some of the fruit moth parasites attack weed-infesing larvae should be borne in mind. Packing houses and used baskets frequently harbor many hibernating larvae, and these should be given attention during periods of fruit moth abundance.

"In Ohio orchards fruit moth larvae have been found feeding in the fruits of peach, apple, quince, pear, and plum and in the twigs of peach, apple, and sweet cherry. They have also been found in the growing tips of a rose bush.

"Larval mortality varies with the hardness of the peach fruit in which the larvae feed. Natural mortality is low early in the season when the peach is growing rapidly, high in midseason while the stone is hardening, and low again when the peach swells rapidly before ripening.

"Eight infestation counts made in a particular orchard during three successive seasons have shown an unequal but consistent fruit moth distribution across the orchard. One side was consistently most heavily infested. Such peculiar distributions have not been adequately explained.

"In experimental spraying work a combination of summer oil and nicotine has uniformly given best results. Five applications made to quinces during the latter part of the season produced a large percentage of marketable fruit in 1935; whereas unsprayed quinces in the immediate vicinity were almost a total loss. Experience has shown that any spraying program for fruit moth control must be timed with precision if the greatest good is to result.

"Approximately 25,000 individuals of *Macrocentrus ancylivorus* have been released in Ohio. This parasite species has been multiplying rapidly in northern Ohio and has been largely responsible for a significant reduction in fruit moth injury in that part of the State. Eight species of foreign parasites have been introduced into Ohio, but as yet none are known to have become established. Native parasite species and other natural enemies have become sufficiently abundant in central and southern Ohio to suppress the fruit moth population. Several of the more important fruit moth parasites are known to attack the ragweed borer [*Epiblema strenuana* Walk.] and the strawberry leaf roller, both of which are generally distributed in Ohio. These parasites, therefore, should be able to survive during periods when fruit moth larvae are scarce."

Laspeyresia molesta Busck and its Argentine parasites [trans. title], U. L. CRISTOBAL (*Rev. Facult. Agron. La Plata, 3. ser., 20 (1935), No. 2, pp. 140–169, figs. 21*).—An account of the oriental fruit moth, its biology and injury to the fruit, is followed by information on its natural control, including four parasites encountered in La Plata, namely, *Eudeleboea lopezi* Blanch., *Pimpla behrensiella* Blanch., *Hemiteles venturi* Sch., and *Tyroglyphus* sp. A list is given of 19 references to the literature consulted.

The pea moth (Laspeyresia nigricana Steph.), A. J. HANSON and R. L. WEBSTER (*Washington Sta. Bul. 327 (1936), pp. 22, pls. 6, figs. 5*).—Studies of the pea moth, which in 1928 first appeared as a pest of economic importance in Washington in the Nooksack Valley, Whatcom County, some 12 miles south of the British Columbia line, and became a problem in the Skagit flats of the Mount Vernon district in 1933, are reported upon. The nature of its injury, distribution, life history, description of the stages, host plants, planting dates and varieties, quarantine regulations, soil experiments, value of insecticides, parasites, and the control program are dealt with, the details being given in five tables.

The European corn borer in Indiana, G. A. FICHT (*Indiana Sta. Bul. 406 (1936), pp. 24, figs. 18*).—A practical account of the European corn borer as it occurs in Indiana, with control measures applicable in that State.

An insect injuring sunflowers in Manitoba, R. D. BIRD and W. R. ALLEN (*Canad. Ent., 68 (1936), No. 4, pp. 93, 94*).—The pyralid moth *Homoeosoma electellum* Hlst. is a source of injury to sunflowers in Manitoba through its attack upon the heads, leaves, and stalks. Its life cycle, which includes four larval instars, is completed in 30 days.

Studies in enzymatic histochemistry.—XVI, The digestion of keratin by the larvae of the clothes moth (Tineola biselliella Humm.), K. LINDER-STRØM-LANG and F. DUSPIVA (*Compt. Rend. Lab. Carlsberg, Sér. Chim., 21 (1936), No. 4, pp. 53–82+[1], pl. 1, figs. 2*).—This contribution is presented with a list of 21 references to the literature.

Life-histories of some Indian Thyrididae (Lepidoptera), B. B. BOSE (*Indian Jour. Agr. Sci., 5 (1935), No. 6, pp. 737–742, pls. 3*).—The pyralidid moth

Betousa stylophora Swinh., which is of economic importance through its formation of galls on *Phyllanthus emblica*, is reported upon at some length. A brief account is also given of *Rhodoneura loceusalis* Wlk., which feeds on the leaves and bores tender top shoots of *Loranthus longiflorus* at Pusa, and several additional species are noted.

A list of Lepidoptera (Heterocera) from the State of Minas Geraes [trans. title], E. J. HAMBLETON and W. T. M. FORBES (*Arch. Inst. Biol. [São Paulo], 6 (1935), pp. 213–256; Eng. abs., p. 256*).—A list of 1,445 species of Heterocera occurring in the State of Minas Geraes arranged by families and subfamilies is presented.

How surgical maggots act, L. E. W. BEVAN (*Vet. Rec., 16 (1936), No. 18, pp. 567, 568, 569*).—It is suggested that the manner in which surgical maggots act is not through their generating a ferment but by infecting the wounds with micro-organisms producing proteolytic ferments and other substances which stimulate cell reproduction and hasten resolution. These substances can be reproduced in bulk by in vitro culture of the micro-organisms which generate them.

The bactericidal element of dipterous larvae (myiases of wounds and myiases of fruits) [trans. title], C. PICADO (*Bul. Biol. France et Belg., 69 (1935), No. 4, pp. 409–438, figs. 3*).—It is concluded that the bactericidal element of larvae in myiases does not preexist but is elaborated in the intestines of larvae infesting the wounds and of those infesting fruits when the food is suitable. The bacterial flora of the flesh in putrefaction plays a preponderant role in the elaboration of bactericidal substances. Under an acid condition, maggots in fruit also have been found to elaborate intestinal substances that are bactericidal for staphylococci.

A list is given of 20 references to the literature.

Observations and experiments on the blow-fly (Calliphora erythrocephala) during the first day after emergence, G. FRAENKEL (*Zool. Soc. London Proc., 1936, IV, pp. 893–904, figs. 2*).—Observations on the digging, inflation of the body and expansion of the wings, first filling of the air sacs, and coloration are reported upon, with a list of 16 references to the literature.

The transmission of yaws from man to rabbits by an insect vector, Hippelates pallipes Loew, H. W. KUMM and T. B. TURNER (*Amer. Jour. Trop. Med., 16 (1936), No. 3, pp. 245–271, figs. 5*).—The experiments reported have demonstrated that yaws can be transmitted from man to rabbits by *H. pallipes*, and it is thought probable that this also takes place in transmission from man to man.

Control of fruit fly: Experiments with white oil-nicotine sulphate spray, J. A. WRIGHT (*Agr. Gaz. N. S. Wales, 46 (1935), No. 12, p. 689, fig. 1*).—Control work with *Chaetodacus tryoni* Frogg. indicates that a white oil-nicotine sulfate mixture effects a considerable reduction in infestation by this fruitfly.

Notes on the autecology of some fruit-flies.—I, On the melon-fly, K. KOIDSUMI and K. SHIRATA (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaishi), 7 (1935), No. 3, pp. 245–254*).—This contribution in Japanese deals with the melonfly.

Flies as household pests in Iowa, C. H. RICHARDSON (*Iowa Sta. Bul. 345 (1936), pp. 215–238, figs. 13*).—A practical account of the common species of flies that find their way into the home and procedures for their control.

The effect of desiccation on survival and metamorphosis of the Japanese beetle (Popillia japonica Newman), D. LUDWIG (*Physiol. Zool., 9 (1936), No. 1, pp. 27–42, fig. 1*).—The rate at which different stages of the Japanese beetle become desiccated, under approximately identical environmental

conditions, has been found to decrease in the following order: First-, second-, third-instar larvae, late prepupae, early prepupae, and pupae.

"The maximum fatal limits of desiccation, expressed in weight and as percentage of original weight, varied as follows: Second-instar larvae, 45 percent; first- and third-instar larvae, 50 percent; early prepupae, 56 percent; late prepupae, 66 percent; and pupae, 69 percent. When expressed in terms of water content, the variations were greatly reduced, as shown by the following figures: Third-instar larvae, 62 percent; early prepupae, 59.1 percent; late prepupae, 63.4 percent; and pupae, 65.9 percent.

"The water content of the adult beetle is approximately the same (66–88 percent) regardless of whether it had been previously desiccated in the prepupal or the pupal stages. Water content is restored by a loss of less water at the time of emergence. When larvae are desiccated, water content is restored before development can proceed.

"The prepupal and pupal stages contain more water than is necessary for normal metamorphosis. Pupae can be desiccated until they lose about one-half of the water normally lost at the time of emergence and still emerge normally.

"The duration of the pupal stage is increased by desiccation of either the prepupal or pupal stages. This increase is inversely proportional to the water content of the pupae."

Japanese beetle (Popillia japonica), T. J. HEADLEE (*New Jersey Stas. Circ. 367 (1936), pp. 8, figs. 2*).—A practical account of this beetle.

Japanese beetle control in commercial fruit plantings, T. J. HEADLEE (*New Jersey Stas. Circ. 366 (1936), pp. 7*).—A practical account of control measures for this pest in New Jersey.

Notes on the "flat wireworm" Aeolus mellillus Say, G. M. STIBBETT (*Canad. Ent., 68 (1936), No. 5, pp. 117, 118*).—This wireworm, which has been collected in various parts of Canada but is only sufficiently abundant in southern Ontario, west and south of London, to be of economic importance, has increased in injuriousness from 1930, when it injured tobacco at Charing Cross, Ontario. The important crops thus far damaged include tobacco, corn, and sugar beets.

The bionomics and control of wireworms in Maine, J. H. HAWKINS (*Maine Sta. Bul. 381 (1936), pp. [4]+146, pls. 13, figs. 19*).—The results of studies of wireworms extending over a period of several years are reported upon. An introductory account in which the economic importance of wireworms, food plants of larvae, distribution, a list of the Maine Elateridae, and the morphology and biology of the wheat wireworm are dealt with (pp. 14–50), is followed by accounts of the genera *Melanotus*, *Ludius*, *Limonius*, *Cardiophorus*, and *Athous* and notes on *Ludius cylindriformis* Hbst., *Cryptohypnus abbreviatus* Say, *Oestodes* sp., and *Hemicrepidius decoloratus* Say. Discussions of millepedes sometimes mistaken for wireworms, the ecology of elaterid larvae with special reference to wireworm abundance, wireworm injury to plants, a wireworm census, control measures, nematode parasites of adults of the wheat wireworm, fungi in relation to wireworms, and predaceous enemies of wireworms are then presented.

The life history of the wheat wireworm requires at least 3 yr. for its completion, and some larvae do not pupate until August of the fourth year. The life histories of other species are imperfectly known.

Cultivation was found to be a practical method of controlling wireworms. It required from 1 to 4 yr. to reduce the wireworm population to a point consistent with the safe production of susceptible crops. The time required to

control wireworms by cultivation depended upon the initial infestation. Approximately 45 percent of the wireworm population was found to be eliminated by 1 yr. of cultivation, 65 percent by 2 yr., and 80 percent by 3 yr. of continuous cultivation of the soil. Clean cultivation was also found essential to wireworm control. The wireworm population was apparently but little more reduced in soil kept fallow than it was in soil in which cultivated crops were grown.

Baits of clover, cut and placed on the soil, were the most attractive of those used for beetles of the wheat wireworm. Poisons added to baits for the adults also acted as repellents in most cases. Beetles of *C. abbreviatus* were attracted to baits of graham flour dough.

The most important parasite of the wheat wireworm found was a nematode, *Hexamermis* sp. This parasite lives in the body of the beetle and apparently prevents the eggs of the host from becoming fully developed.

A list of 85 references to the literature is included.

On some parasites found in association with the stem weevil pest of cotton in south India (Pempheres affinis, F.) and their role in its biological control, T. V. R. AYYAR and V. MARGABANDHU (*Madras Agr. Jour., 24 (1936), No. 8, pp. 102–107*).—Notes are presented on parasitic insects commonly associated with the stem weevil enemy of cotton in south India.

A cluster of bees, T. RAYMENT (*Sydney: Endeavour Press, 1935, pp. 752, pls. [8], figs. [205]*).—The first part of this work, to which the introduction is by E. F. Phillips, consists of 60 essays on the life history of Australian bees. Part 2 (pp. 635–743) consists of descriptions of over 100 new species and subspecies, representing the families Hylaeidae, Colletidae, Melectidae, Andrenidae, Anthrophoridae, Megachilidae, Xylocopidae, Ceratinidae, Apidae, Ichneumonidae, Thynnidae, and Phloeothripidae.

Disease resistance and American foulbrood, O. W. PARK (*Amer. Bee Jour., 76 (1936), No. 1, pp. 12–15, figs. 13*).—Work at the Iowa Experiment Station led to the conclusion that variation in resistance to American foul brood does exist in honeybees, marked resistance having been demonstrated by several colonies.

Tetrastichus brevistigma, new species (Hymenoptera: Eulophidae), A. B. GAHAN (*Ent. Soc. Wash. Proc., 38 (1936), No. 4, pp. 76, 77*).—A parasite reared from pupae of the elm leaf beetle at Middleboro and Woburn, Mass., is described as new under the name *T. brevistigma*.

The morphology and biology of Anastatus [Hym. Chalcididae] parasites of the oothecae of mantids [trans. title], F. BERNARD (*Bul. Soc. Ent. France, 41 (1936), No. 5, pp. 69–75, fig. 1*).—The author reports that the oothecae of small Mediterranean mantids of the genus *Ameles* are abundantly parasitized by two chalcids of the genus *Anastatus*, namely, *A. amelcophagus*, a very common parasite, and *A. picardi* n. sp., rarely met with.

Heterospilus coffeicola Schmied., parasite of the coffee berry borer Stephanoderes hampei (Ferr.) [trans. title], S. DE TOLEDO PIZA, JR., and J. PINTO DA FONSECA (*Arch. Inst. Biol. [São Paulo], 6 (1935), pp. 179–199, pl. 1, figs. 12; Eng. abs., p. 199*).—A contribution to the biology of *H. coffeicola*, a hymenopterous parasite, which feeds on the eggs of *S. hampei*, is presented. "The feeding activities of this parasite are confined to those fruits in which primary infestation has occurred. In fruits of secondary infestation by the coffee berry borer, *H. coffeicola* fails to develop. *H. coffeicola* can only survive in regions where coffee production occurs throughout the entire year. In order that this insect may become an effective agent in the control of the coffee berry borer in Brazil, it would be necessary to maintain permanent infestations of the borer in the open air."

Sawfly biologies.—I, Neodiprion tsugae Middleton, G. R. HOPPING and H. B. LEECH (*Canad. Ent., 68 (1936), No. 4, pp. 71–79, figs. 2*).—A study of the biology of the western hemlock sawfly *N. tsugae*, which injured hemlock over an area of 40 sq. miles on Queen Charlotte Islands, British Columbia, in 1931, is reported upon. In 1932 the outbreak showed definite signs of subsiding and had practically disappeared by 1933. Many trees were killed during the peak year of 1931, indicating that this is a primary enemy of western hemlock and that outbreaks may be expected from time to time in the Pacific Northwest. There is said to be a single generation of this sawfly, which hatches out in May, the larvae feeding through June and spinning up through July and early August. Five hymenopterous parasites were reared from the larvae or pupae, namely, *Delomerista* sp., *Phaeogenes hariolus* Cress., *P. articus* Cush., *Pezoporus* sp., and *Olesicampe* sp.

The tomato mite (Phyllocoptes lycopersici Tryon.), W. L. MORGAN (*Agr. Gaz. N. S. Wales, 46 (1935), No. 12, pp. 683, 684, figs. 3*).—The tomato mite, first recorded in Queensland in 1917 from tomatoes, has seriously damaged this crop in the greenhouse since its appearance near Sydney in 1929.

Notes on the occurrence and host relationships of the tick Ornithodoros talaje in Arizona, G. M. KOHLS and R. A. COOLEY (*Pub. Health Rpts. [U. S.], 51 (1936), No. 17, pp. 512, 513*).—This tick transmitter of relapsing fever, the bite of which is very painful to man, is reported to have been collected in the larval stage from the kangaroo rat (*Dipodomys* sp.) in the vicinity of Aguila, Ariz. Nymphs and adults were found in soil from the kangaroo rat burrows.

Ornithodoros parkeri, a new species on rodents, R. A. COOLEY (*Pub. Health Rpts. [U. S.], 51 (1936), No. 15, pp. 431–433, pl. 1*).—The name *O. parkeri* is given to a new tick collected from rodents in Wyoming and Washington, including ground squirrels (*Citellus* sp.), a jack rabbit, a cottontail rabbit, and a prairie dog.

The black widow spider rare in Michigan, R. HUTSON (*Michigan Sta. Quart. Bul., 18 (1936), No. 4, p. 247*).—A brief practical description of *Latrodectus mactans* Fab.

ANIMAL PRODUCTION

[Livestock investigations in Alaska] (*Alaska Col. Sta. Bul. 4 [1935], pp. 29–36, 42–44, figs. 5*).—Preliminary results are reported on crossing mountain sheep with domesticated sheep, by L. J. Palmer; and the development of a hardy strain of dairy cattle by crossing the Holstein and Galloway breeds at the Matanuska Substation, by D. L. Irwin, including milking records.

[Investigations with livestock in Indiana] (*Indiana Sta. Rpt. 1935, pp. 19–23, 50–52, figs. 2*).—Results obtained in tests with beef cattle are reported on tankage for fattening cattle, finishing cattle without corn, comparative cost of wintering wet cows and dry cows, spring v. fall calves, native v. western calves, and heifer v. steer calves for beef production.

Swine tests yielded information on the effect of soybeans and soybean products on the quality of pork, the nutritive value and mineral deficiencies of soybeans and soybean products, the value of heated water for swine, the value of soybeans for brood sows, local and terminal market price differentials, and the influence of feeding at market on the warm dressing yield of hogs.

Results are noted from 25 yr. of lamb feeding, feeding lambs without hay, tankage as a protein supplement, pasture for lambs, shearing native lambs, grain for young lambs, and feeding twin lambs.

In poultry studies data were obtained on marketing eggs under U. S. grades and on a graded basis, inheritance of rate of growth, wheat and oats as substitutes for bran and middlings in broiler rations, reduction of protein in rations

for chicks, soybean oil meal in broiler rations, amounts of corn in laying rations, condensed buttermilk for laying pullets, poultry housing, feeding of turkeys, and meat scrap and dried milk in rations for young ducks.

[Livestock investigations in Tennessee], M. JACOB (*Tennessee Sta. Rpt. 1934, pp. 9–13*).—Results obtained in tests with beef cattle are reported on the effect of adding dicalcium phosphate to a ration of cottonseed meal and corn-and-sorghum silage for fattening 2-year-old steers, the amount of grain necessary to feed 2-year-old steers being finished on grass at the Middle Tennessee Substation, a comparison of ground shelled corn and cottonseed meal v. cottonseed meal alone as concentrates for feeding calves, and the amount of grain necessary for the most economical finishing of baby beeves at the West Tennessee Substation.

A comparison was made of the value of alfalfa, bluegrass, sweetclover, lespedeza, and other grazing crops for fattening pigs fed corn and tankage at the Middle Tennessee Substation.

In sheep studies, information was obtained on the value of supplemental feeds for early spring lambs finished on pasture and on breeds of sheep most suitable for Tennessee.

Mineral requirements of animals (*U. S. Dept. Agr., Bur. Anim. Indus., Anim. Husb. Div., 1936, A. H. D. No. 17, rev., pp. 3*).—The need of adding minerals to the rations of livestock is discussed. In addition, lists are given of feeding stuffs and inorganic minerals rich in calcium and phosphorus. The mineral content of some of the more common feeds is given in table form.

Sulphur metabolism.—I, The absorption and excretion of flowers of sulphur, J. H. KELLERMANN (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 4 (1935), No. 1, pp. 199–228*).—In metabolism tests with both rats and sheep, it was demonstrated that both absorption and excretion of inorganic sulfur occurred at a very slow rate. From 11 to 12 days was required for the inorganic sulfur of the urine to return to normal after sulfur feeding was discontinued, apparently due to the storage of sulfur in the animal body and also to long retention of sulfur in the digestive tract. Elemental sulfur was less readily absorbed than food sulfur, the absorption of the former occurring in adverse proportion to the concentration of the latter in the diet. On this basis, the greater the concentration of food sulfur in the diet, the higher will be the toxic level of elemental sulfur.

The daily ingestion of 5 g of inorganic sulfur had no deleterious effect on sheep, while the addition of 1 percent of sulfur to the basal ration was definitely toxic to rats. The rate of absorption was 28.13 percent for the sheep and 38 percent for the rats.

The composition and digestibility of mung-bean silage, with observations on the silica-ratio procedure for studying digestibility, W. D. GALLUP and A. H. KUHLMAN (*Jour. Agr. Res. [U. S.], 53 (1936), No. 11, pp. 889–894*).—The digestibility of silage made from Golden mung beans was determined at the Oklahoma Experiment Station with four milk cows receiving the silage alone over a period of 17 days.

The average composition of the fresh silage was 67.3 percent moisture, 4.8 percent crude protein, 7.3 percent crude fiber, 1.4 percent fat, 13.1 percent nitrogen-free extract, and 6.1 percent ash. The average coefficients of digestibility obtained were 45.2 for dry matter, 54.2 for protein, 47.8 for crude fiber, 72.6 for fat, and 57.8 for nitrogen-free extract. An attempt made to determine the digestibility by calculating the food substance to silica ratio of the feed failed because the silica content of the silage varied from day to day, presumably due to an uneven distribution of silica in the silage and to stratification and loss of silica in its passage through the intestinal tract.

Palatability of cottonseed and linseed meals, G. A. BRANAMAN (*Michigan Sta. Quart. Bul., 18 (1936), No. 4, pp. 253, 254*).—A test with 12 heifer and 12 steer calves fed by the reversal method was undertaken to compare the palatability of 43-percent protein cottonseed meal and 37-percent protein linseed meal. All of the animals received the same basal ration fed twice daily in individual stalls.

No differences were noted in feed consumption to indicate a preference for either feed. The average daily gains and the amount of feed required per 100 lb. gain were also approximately the same whether the calves received cottonseed meal or linseed meal.

Analyses of feeds for farm animals (*U. S. Dept. Agr., Bur. Anim. Indus., [Anim. Husb. Div.], 1936, A. H. D. No. 20, pp. 6*).—Tables, compiled by G. L. Bidwell and A. T. Semple, give the chemical analyses and digestible nutrients of grains and their products; hays, stovers, and fodders; oil-bearing and legume seeds; green forages; roots, tubers, and fruits; silages; and miscellaneous byproducts.

Commercial feeding stuffs—report on inspection, 1935, E. M. BAILEY (*Connecticut [New Haven] Sta. Bul. 385 (1936), pp. 451–539+XVII–XX*).—This is the usual report of the guaranties and analyses of 1,320 samples of feeding stuffs collected for official examination during the calendar year 1935 (E. S. R., 73, p. 826).

Commercial feeding stuffs, H. R. KRAYBILL ET AL. (*Indiana Sta. Circ. 220 (1936), pp. 31, fig. 1*).—This is the condensed report of commercial feed inspection for 1935. A table lists the results of the examination of 2,827 samples of feeds and shows the number of samples incorrectly guaranteed, seriously deficient, or misbranded (E. S. R., 74, p. 81).

Analyses of commercial feeding stuffs and registrations for 1936, C. S. CATHCART (*New Jersey Stas. Bul. 608 (1936), pp. 64*).—Analyses are reported for protein, fat, and fiber of 1,579 samples of commercial feeding stuffs collected for official inspection during 1935, including a list of the ingredients found by microscopic examination (E. S. R., 74, p. 527).

Preserving farm-dressed meat in freezer storage, K. F. WARNER (*U. S. Dept. Agr., Bur. Anim. Indus., Anim. Husb. Div., 1935, A. H. D. No. 16, pp. 4*).—The development and uses of "freezer lockers" for preserving fresh meat are described, together with information on the preparation of the products for the lockers.

The estimation of the heat production of cattle from the insensible loss in body weight, H. H. MITCHELL and T. S. HAMILTON (*Jour. Agr. Res. [U. S.], 52 (1936), No. 11, pp. 837–854*).—Experiments were conducted at the Illinois Experiment Station to determine the insensible loss in body weight of steers under controlled conditions of environmental temperature and humidity and to correlate such losses with the heat production of the steers, determined in an open circuit respiration chamber.

The data showed that the percentage of insensible loss in body weight represented by vaporized water varied inversely with the respiratory quotient and approached 100 as the percentage of heat lost from the body by vaporization increased. The insensible loss was sensitive to changes in environmental temperatures, particularly above 70° F. Changes in relative humidity were without certain effect up to values of 80 percent or more. The hair coat, through its effect upon the vaporization of water from the skin, was a great factor in determining the insensible loss in body weight. Removal of most of the hair coat reduced the loss by 20 to 30 percent. A regular water intake favored a regular insensible loss in weight, while lack of water for several days depressed the insensible loss to abnormally low levels.

By rigorous control of all factors known to affect vaporization the day-to-day variation in the insensible loss of weight under the conditions of this study were reduced to a magnitude represented by a coefficient of variation of about 6 percent. The ratio between heat lost by vaporization and total heat output was not constant under the same environmental conditions but was an individual characteristic.

The success of a method of predicting the heat production of steers from their insensible losses in weight depended upon (1) a careful determination of the latter under standardized conditions, (2) a preliminary estimate on each animal of the fraction of heat lost in the vaporization of water under the given standardized conditions, and (3) fairly good estimates of the respiratory quotient to be expected from the experimental ration.

Color of lean of beef as affected by grass and grain feeding, J. H. LONGWELL (*West Virginia Sta. Bul. 274 (1936), pp. 8*).—Color readings were made with a spectrophotometer on beef samples taken from yearling, 2-year-old, and 3-year-old cattle fed either at Morgantown or Lewisburg. These animals had received varying amounts of grain and grass.

Analysis of the readings showed that grass as a feed did not produce dark lean in beef. The brightness of the lean appeared to be directly related to the degree of finish. While a few cattle in these tests killed dark, the individual animals came from different lots and the color was apparently without relation to the feed consumed. It is concluded that beef from grass-finished cattle can be as bright as beef from grain-finished cattle showing a comparable degree of finish.

Fertility in sheep: Artificial production of seminal ejaculation and the characters of the spermatozoa contained therein, R. M. C. GUNN (*Austral. Council Sci. and Indus. Res. Bul., 94, (1936), pp. 116, figs. 8*).—This bulletin presents a detailed description of a method of applying electrical stimulation to rams resulting in the emission of normal semen. Such stimulation caused a complete emptying of the vas deferens, the average ejaculation totaling about 1.5 ml. The effects of varying intensity of stimulation on certain body functions and the effects of a number of drugs on the reaction to stimulation are discussed.

Frequently induced ejaculation has proved harmless to rams. Spermatozoa obtained in this manner have survived 12 days or more when stored in vitro at 4° C. Other factors influencing the longevity of the spermatozoa stored in vitro are discussed. The results of trials in artificially inseminating ewes and the wider application of this method are discussed.

Raising export lambs on subterranean clover pasture lands, L. J. COOK (*Jour. Dept. Agr. So. Austral., 39 (1935), No. 1, pp. 36–44*).—This article presents data on the results of mating purebred Southdown, Dorset Horn, Suffolk, English Leicester, and Ryeland sires to thrifty comeback ewes (Merino rams × half-bred English Leicester-Merino ewes) with regard to efficiency of lambing, weight, carcass quality, market value of lambs, return of lamb value per ewe that bred, and returns per ewe less lamb grazing costs. Rather pronounced differences were noted in the net returns from lambs resulting from the different crosses.

In general it is concluded that the raising of fat lambs on improved pasture has been quite satisfactory, particularly when they were grazed on well fertilized pasture and when dropped sufficiently early to enable them to be marketed before grass approached maturity.

Sugar beet by-products for fattening lambs, A. S. INGRAHAM (*Wyoming Sta. Bul. 216 (1936), pp. 20, fig. 1*).—This series of lamb-feeding trials was designed to determine the value of sugar beet tops (pastured) as the only ration and when supplemented with either alfalfa or barley or both, and also the value of cured beet tops fed in dry lot and the comparative value of wet beet pulp and dried molasses pulp in the dry-lot ration.

Based on 3 years' trials beet tops fed by pasturing without any supplement were found to be a very satisfactory ration over a 6- to 8-week period and were shown to have a feed replacement value considerably greater than their ordinary selling price. The tops from 1 acre of beets yielding 18 6 tons provided ample feed for 1,000 lambs for 1 day. The addition of a small amount of alfalfa to the ration slightly increased the rate of gain, but did not add to the profits obtained. Adding barley to the ration either with or without hay materially increased the cost per pound of gain, although increasing the rate of gain and improving the finish on the lambs. The lambs receiving barley while on pasture made more rapid and more economical gains during the subsequent dry-lot feeding period.

Cured beet tops were found to be a satisfactory supplement to the dry lot ration, but the additional labor involved reduced net returns to approximately one-half those secured by pasturing the tops. Dried molasses pulp was less economical than wet pulp as a supplement to alfalfa and barley in the finishing ration.

The effect of feeds on the quality and palatability of lamb, J. E. RICHARDSON and W. F. DICKSON (*Montana Sta. Bul. 320 (1936), pp. 19*).—In this cooperative study, conducted between the departments of animal husbandry and home economics over a period of 9 years, it was found that the use of wheat screenings or dockage containing many hard weed seeds resulted in flabby meat covered with a scant layer of greasy fat and having a peculiar flavor. Of the various weed seeds fed the fanweed seed imparted the most objectionable flavor. When fed with alfalfa hay oats were slightly superior to wheat and barley in producing roasts of quality, juiciness, and general desirability. Barley appeared to produce consistently a rather greasy fat and a pronounced flavor in the lean. Adding wet beet bulp to a ration of wheat, barley, or oats and alfalfa hay improved the rate of gain and reduced the differences in palatability scores. Adding either dry or wet beet pulp to a ration of oats and alfalfa hay resulted in roasts that were similar and desirable in quality and palatability.

During the roasting process the total shrinkage averaged about 25 percent when roasts were cooked to 182° F. by an oven temperature of 257° after being seared 20 min. at 527°. Approximately one-half of the total shrinkage was by evaporation and the other half by drippings. These shrinkages were not appreciably altered by the ration fed or by the kind of cut roasted. It required about 40 min. per pound to roast loins to the well-done stage and about 37 min. per pound for leg roasts.

Winter forages for fattening hogs: A comparison of barley, rape, rye, and oats, E. D. KYZER, L. V. STARKEY, T. M. CLYBURN, and E. G. GODBEY (*South Carolina Sta. Circ. 54 (1936), pp. 12*).—In this study comparisons were made of dry-lot and pasture feeding, of winter forages for fattening pigs, and of protein supplements. In the phase of the work conducted at the Coast Substation white corn was fed, while at Clemson College yellow corn was used.

The results showed that when the basal ration consisted of white corn and menhaden fish meal the daily gains were significantly increased by the use of forages as compared with the gains in dry lot. With yellow corn forage did not produce significantly greater gains. In dry lot the white corn and fish meal ration sometimes produced a vitamin A deficiency that was apparently corrected by the use of green forage or yellow corn. Barley, rye, rape, and oats had approximately equal value when used as winter forages.

Forage reduced the concentrates needed per 100 lb. of gain about 5.4 percent when white corn was fed. In this case the amount of supplement was reduced 23 percent. With yellow corn the total feed per 100 lb. of gain was practi-

cally the same in dry lot and on forage, but forage reduced the need of supplement per unit of gain about 29 percent. The corn requirements per unit of gain were the same whether the protein supplement consisted of fish meal alone or of equal parts of fish meal and cottonseed meal The mixed supplement increased the amount of this nutrient required per 100 lb of gain 59 percent with white corn and 70 percent with yellow corn. The feed-saving value of an acre of forage was $9.65 when grazed by pigs fed white corn and $5.29 when yellow corn was used.

Grinding corn for swine, M. A. McCarty, J. E. Nicholas, and T. B. Keith (*Pennsylvania Sta. Bul. 326 (1936), pp. 11, figs. 3*).—A series of tests was conducted to determine the relative value of different degrees of fineness of grinding corn when compared with whole corn as measured by gain in body weight of growing and fattening pigs. The same basal ration was used for pigs fed individually in lots receiving fine-, medium-, and coarse-ground corn.

There was an advantage over whole corn of 17, 21, and 15 percent, respectively, in favor of fine-, medium-, and coarse-ground corn in total average daily gains for the pigs in these trials. These differences were not considered large enough to indicate that any one fineness of grinding was superior to that of any other.

The preparation of feed for colts, A. B. Caine (*Iowa Sta. Bul. 347 (1936), pp. 279–302, figs. 5*).—In order to determine the effects of rolled oats on the rate of gain, feed requirements, and cost of feeding draft colts, two experiments were conducted using 8 weanling colts in the first and 6 weanling and 4 yearling colts in the second test.

The results showed that colts made slightly larger gains and required less feed per unit of gain on prepared oats than on whole oats. The rolled oats were not so palatable as the whole grain. At the end of each experiment the colts fed rolled oats had the appearance of being fatter.

In a test to determine the value of preparation of roughage for colts it was found that the palatability of good quality roughage was not increased by grinding or cutting. Observations indicated that the advantage of chopping hay was due to the reduction in waste. Colts required more time to consume chopped hay than long hay.

[Poultry investigations in Rhode Island] (*Rhode Island Sta. Rpt. [1935], pp. 31, 32*).—Results obtained in a study of the effect of certain calcium intake levels on hatchability and eggshell formation are reported.

The secretory activity of the parts of the hen's oviduct, V. S. Asmundson and B. R. Burmester (*Jour. Expt. Zool., 72 (1936), No. 2, pp. 225–246, figs. 2*).—In an experiment at the California Experiment Station the effect of surgically resecting different sections of the oviduct on the shape, size, and composition of eggs was determined. In all cases the weight of the yolk was greater after the operation, while shape and size of the egg showed considerable variation. Removal of the anterior section of the albumin tube decreased the amount of liquid albumin, while removal of the posterior portion resulted in a decrease of the firm albumin and increase in the liquid fraction, indicating a qualitative difference in the secretion of the different sections of the albumin tube. Resection of part of the isthmus reduced the amount of shell membrane, while resection of the anterior part of the uterus reduced the amount of the shell. Only when the resected portion included more than one part of the oviduct was there a reduction in more than one part of the egg.

Seasonal changes in interior egg quality of Single Comb White Leghorn hens, J. A. Hunter, A. Van Wagenen, and G. O. Hall (*Poultry Sci., 15 (1936), No. 2, pp. 115–118, fig. 1*).—The [New York] Cornell Experiment Station has determined the seasonal change occurring in the interior quality of eggs over

a 1-yr. period, as indicated by the condition of firm albumin, the percentage of thin albumin, yolk index, and yolk color. Eggs of highest quality were produced from November to March, with a lowering of quality beginning in March and April and continuing through the summer. No seasonal change in yolk color was noted.

Salt requirements of poultry, J. G. HALPIN, C. E. HOLMES, and E. B. HART (*Poultry Sci., 15 (1936), No. 2, pp. 99–103*).—This study at the Wisconsin Experiment Station undertook to find the optimum level of salt supplement for poultry rations. Salt was added to the ration of day-old chicks in one trial at the rate of 0, 1, and 5 percent, and in a second trial at the rate of 0, 0.5, 1, and 2 percent of the basal ration. Feeding 5 percent of salt resulted in slower growth and a much higher mortality of chicks, particularly at 5 to 8 weeks. This lot also matured more slowly, came into production later, and laid fewer eggs. Comparatively little difference was noted in growth rates, mortality, or egg production of any of the other groups. Apparently 5 percent of salt is more than is desirable, 2 percent is neither injurious nor advantageous, while some salt seems desirable.

The distribution and storage of fluorine in the tissues of the laying hen, K. HAMAN, P. H. PHILLIPS, and J. G. HALPIN (*Poultry Sci., 15 (1936), No. 2, pp. 154–157*).—The Wisconsin Experiment Station has studied the effect of adding fluorine-bearing minerals (raw rock phosphate and phosphatic limestone) to the basal diet of laying hens on the fluorine storage in various body tissues. With the fluorine content of the ration ranging from 0.005 to 0.105 percent, the storage was found to be directly proportional to the level fed. Most of the fluorine was contained in the bones, with small quantities in the active tissues such as the liver and kidneys, still less in muscle tissue, and very little in the fat.

Artificial insemination of fowls (*U. S. Dept. Agr., Bur. Anim. Indus., Anim. Husb. Div., 1936, A. H. D. No. 19, pp. 2*).—A method of obtaining spermatozoa from male birds and the technic of artificial insemination of hens are described.

The effect of cod-liver oil in the diet of the mother hen on embryo mortality and on the calcium and phosphorus content of the embryo, W. M. INSKO, JR., and M. LYONS (*Kentucky Sta. Bul. 363 (1936), pp. 63–81, figs. 3*).—The data reported in this bulletin were concerned with embryo mortality as influenced by cod-liver oil fed to White Leghorn pullets (1) confined to the house with sunshine only through window glass, (2) confined to the house and allowed sunshine in a wire-screened porch, and (3) allowed bluegrass range. A study was also made of the effect of the first and third sets of conditions upon the calcium and phosphorus content of the embryo.

Pullets confined without vitamin D supplement produced eggs having a very high embryo mortality during the third week of incubation. Exposure to sunshine or access to bluegrass range markedly reduced mortality during this period, and the range was more effective than sunshine alone. Adding cod-liver oil to the ration under the above conditions decreased embryo mortality during the third week. The decrease was most marked in the confined lot, with only a slight decrease in the bluegrass lot.

The calcium and phosphorus content of embryos from the pens receiving no antirachitic treatment was consistently less after the sixteenth day than that of embryos from other pens. The greatest difference in this respect occurred on the eighteenth or nineteenth day of incubation, which coincided with the peak of embryo mortality during the last week of incubation.

Studies on the calcium metabolism of laying hens, H. J. DEOBALD, E. J. LEASE, E. B. HART, and J. G. HALPIN (*Poultry Sci., 15 (1936), No. 2, pp. 179–185, figs. 3*).—The Wisconsin Experiment Station has studied the effect of various

levels of calcium intake on the blood calcium, skeletal calcium, and calcium content of the eggs produced, also the effect of parathormone injections during calcium starvation on the calcium metabolism.

The blood calcium of hens on low calcium intake was lowered, but for any individual hen the variation during her complete egg cycle (36 hr.) was not more than 4 mg per 100 g of whole blood. When hens were deprived of calcium the calcium content of eggshell was reduced to less than 25 percent of the normal, egg production virtually ceased within 12 days, and approximately 10 percent of the skeletal calcium was removed to supply the requirement for eggshell formation. During calcium starvation repeated 1-cc injections of parathormone had no noticeable effect on calcium metabolism, while single large injections produced marked rise of the blood calcium 3 to 7 hr. after injection in actively laying hens.

Effect of packing materials on the flavor of storage eggs, P. F. SHARP, G. F. STEWART, and J. C. HUTTAR ([*New York*] *Cornell Sta. Mem. 189 (1936), pp. 26, figs. 6*).—For this study clamp-top glass fruit jars were packed with two layers of four eggs each, together with half a filler, or one flat, or a corresponding amount of other material being investigated. Clean, unwashed eggs from 2 to 4 hr. old were used. The eggs were sealed in the jars, with provisions for reducing the humidity due to the continuous escape of moisture from the eggs. The jars were placed in storage at 30° to 34° F. After being removed from storage, the eggs were immersed in boiling water for 2.75 min., the blunt end of the shell removed, and the yolk mixed with the uncoagulated part of the white. The eggs were then tasted by selected judges.

The mean of a number of taste scores gave a reliable quantitative value for the flavor of eggs and could be used as a measure of the effect of factors involved in their production. The linear relation found between odor and taste of eggs indicated that the flavor obtained by tasting was due largely to the sense of smell. Great variations were found among the different persons in the ability to score eggs for flavor. There were no indications that the judges became unreliable because of fatigue after scoring from 4 to 10 eggs. The maximum ability to judge for flavor was attained only after a number of eggs had been tasted. The results did not substantiate the claim that for best flavor discrimination the eggs must be tasted while hot. Better agreement in score of eggs was obtained with good- and bad-flavored eggs than with eggs of intermediate flavor. One judge was unable to detect "musty" eggs.

The glass jars equipped with the humidity-regulating solutions proved very satisfactory for determining the effects of absorption of flavors from packing materials. These materials varied in transmitting flavors to eggs during storage. Eggs of relatively high pH developed a more undesirable flavor in storage, regardless of the type of packing, than did eggs in which the pH was held low. The effect of increasing humidity on absorption of flavors from the materials was determined by the properties of the packing material itself.

Levels of meat scraps and dried milk in rations for young ducks, R. E. ROBERTS (*Poultry Sci., 15 (1936), No. 2, pp. 136–140*).—The Indiana Experiment Station has studied the effectiveness of rations containing meat and bone scrap and dried skim milk in percentage ratios of 20:5, 15:5, 10:5, and 10:0 for growing young ducks. The ration containing 10 percent of meat and bone scrap and 5 percent of dried skim milk proved entirely satisfactory and was superior to the ration containing no dried milk. While slightly less feed was required per unit of gain on the higher protein rations, there seemed but slight justification for using more than 10 percent of meat scrap. No differences in mortality could be attributed to the different rations.

Force-molting of White Leghorn hens, F. L. Knowlton (*Oregon Sta. Circ. 119 (1936), pp. 8*).—A comparison of the records over a 2-yr. period of force-molted and naturally molted flocks showed that forced molting was not profitable and could not be recommended as a dependable method of increasing the income. Mortality was about twice as high in the force-molted flock that was subsequently kept under all-night lights as in the naturally molted flock. Severe culling was necessary to keep production above 50 percent in the force-molted flock, while none was needed in the naturally molted flock. Egg production was also higher in the naturally molted flock.

Carbon monoxide poisoning in chickens, G. W. Stiles, Jr. (*Poultry Sci., 15 (1936), No. 3, pp. 270–272, fig. 1*).—This paper describes two cases in which death of hens was definitely diagnosed as due to carbon monoxide poisoning, evidently due to a smoky kerosene lamp used for tempering drinking water. It is suggested that smoky kerosene lamps in brooder houses may be the source of previously unexplained losses in chicks and turkey poults.

Effect of season on the growth and feed consumption of turkeys, V. S. Asmundson and W. E. Lloyd (*Poultry Sci., 15 (1936), No. 2, pp. 186–191, fig. 1*).—This study from the California Experiment Station indicates that early-hatched turkey poults grew more rapidly than late-hatched birds during the first 8 to 12 weeks, after which the latter group gained more rapidly, until at 32 weeks there was no significant difference in the size of the females of the two groups. However, the early-hatched males were still heavier than the later-hatched group. Prevailing temperatures while birds were actively growing seemed the most probable explanation of these differences in growth rate. The amount of feed consumed varied directly with the amount of gain, at least to 16 to 20 weeks, while the feed required per unit of gain increased with age in all cases.

Studies relative to the estimation of vitamin D, II, III (*Poultry Sci., 13 (1934), No. 6, pp. 353–357, figs. 2; 15 (1936), No. 2, pp. 127–135, figs. 2*).—This series of studies (E. S. R., 73, p. 832) has been continued.

II. *Effect of seasonal variation and sex upon calcification in rachitic chicks,* L. L. Lachat.—Groups of day-old chicks, including both sexes, were fed rachitogenic diets for either 4- or 5-week periods. Bone ash analysis showed chicks of both sexes to be markedly rachitic at 4 weeks as well as 5 weeks of age. No significant difference was noted in the bone ash content of males and females. A seasonal difference in the rate of calcification was noted, which could be divided into definite seasonal periods.

III. *Effect of calcification upon growth and sex differences in White Leghorn chicks,* L. L. Lachat and H. A. Halvorson.—In this series of tests six groups of day-old chicks, including both sexes, were fed on the basal rachitogenic diets plus varying quantities of antirachitic supplements at such levels as to produce a range from severe rickets and subnormal growth to normal calcification and growth during the 4-week period. Apparently deprivation of vitamin D affects growth and calcification of females more seriously than males, although females utilized vitamin D more efficiently. A high degree of correlation was found to exist between body weight and calcification, amounting to 0.759 ± 0.02 for males and 0.819 ± 0.014 for females. Since growth rates are seasonally affected, this relationship explains the seasonal variations in calcification as noted above. Females are considered more satisfactory than males for vitamin D investigation.

Comparison of digestibility in gizzardectomized and normal fowls, J. C. Fritz, W. H. Burrows, and H. W. Titus (*Poultry Sci., 15 (1936), No. 3, pp. 239–243*).—In this study at the U. S. D. A. Beltsville Research Center three birds from which the gizzards had been surgically removed and four normal birds

were used in a series of digestion trials in which coefficients of apparent digestibility were determined for ground yellow corn, coarsely cracked yellow corn, and cracked soybeans. The rate of food passage through the digestive tract of the gizzardectomized birds was more rapid, particles of corn appearing in the droppings within 95 min, after ingestion. This group showed a much lower digestibility of all constituents than the normal birds when coarse feeds were given. When ground corn was fed there was a small but consistent difference in favor of the normal lot, with the greatest difference observed in the digestibility of the crude protein.

The differences were not sufficiently great to indicate a secretion of digestive enzymes in the gizzard, and apparently it functions largely, if not solely, as a grinding organ.

Influence of egg production and other factors on the iron content of chicken blood, A. R. WINTER (*Poultry Sci., 15 (1936), No. 3, pp. 252–255*).—The Ohio State University made iron determinations on the blood of approximately 300 hens from 14 to 16 mo. of age. This included hens in production, both on range and under confinement, and some with complications such as gray eyes and bumblefoot, and on hens out of production, some of which were in molt.

Rather wide variations in the iron content of the blood were noted, ranging from 20.1 to 37.2 mg per 100 cc of blood, with an average of 27.1±0.2 mg. Approximately the same range was found in each of the groups studied, leading to the conclusion that production, confinement, molt, gray eyes, or bumblefoot do not produce quickly noticeable or marked changes in the iron content of the blood.

A preliminary report on the injurious effect of sodium bicarbonate in chicks, J. F. WITTER (*Poultry Sci., 15 (1936), No. 3, pp. 256–259*).—In this study from the University of Maine the effect of adding various concentrations of sodium bicarbonate to the drinking water of young chicks was determined.

A 0.6-percent solution caused an increase in water consumption and moist droppings but apparently had no injurious effects on chicks over 2 weeks old, although swollen kidneys were observed in younger chicks. A 1.2- or 2.4-percent solution seriously affected young chicks, caused enlargement and serious damage to the kidneys, increased the uric acid content of the body, reduced vitality, and caused mortality. Sodium bicarbonate apparently is not an entirely safe drug for poultrymen to use, and dosage should be carefully gaged to meet the age tolerance of the chicks.

Inorganic phosphorus and perosis, J. C. HAMMOND (*Poultry Sci., 15 (1936), No. 3, pp. 260–263*).—This paper from the U. S. D. A. Beltsville Research Center presents correlations made on 191 lots of Rhode Island Red chickens, of which 58 lots received rice bran in their diet.

Perosis was found to be highly correlated with inorganic phosphorus, less correlated with total phosphorus, and negatively correlated with organic phosphorus. Rice bran had a marked effect on the correlation of perosis to both inorganic phosphorus and calcium, indicating that there is a factor in rice bran which assists in the regulation of calcium and phosphorus metabolism. It appears that inorganic phosphorus is a primary factor in the etiology of perosis.

The influence of single grains on slipped tendons, H. L. WILCKE (*Poultry Sci., 15 (1936), No, 3, pp. 264–269, figs. 2*).—The Iowa Experiment Station has studied the effect of adding a single kind of grain and various combinations to a satisfactory basal ration on growth rates and frequency of slipped tendon in chicks.

A ration of ground oats plus the basal mixture gave the highest growth rate and freedom from any abnormalities. Ground wheat plus the basal mixture did not support normal growth, apparently due to vitamin A deficiency. Chicks fed

a ration of ground yellow corn plus the basal mixture made slow growth, though very few slipped tendons were noted. Supplementing the ration with either corn bran, yeast, or 10 percent of ground oats did not prevent slipped tendons, but the addition of 20 percent of ground oats or either 10 or 20 percent of rice bran exerted a beneficial effect in this respect. Failure of the corn bran or yeast to give protection indicates that the beneficial effect of oats or rice bran cannot be explained on the basis of either increased fiber content or increase in the vitamin B complex of the ration.

Numbers and uniformity in experimental lots, F. A. HAYS (*Poultry Sci., 15 (1936), No. 3, pp. 235–238. figs. 5*).—This paper from the Massachusetts Experiment Station discusses essential points to be considered in the selection of experimental lots when annual egg production is to be used as a measure of experimental results.

Curves are presented to show the frequency distribution observed in certain groups with reference to annual egg production, age at which first egg was produced, and differences between first and second year's egg production. It is recommended that 100 birds may be a fair sample in an improved flock, while greater numbers are necessary for mixed or unimproved stock. Yearling hens were somewhat less variable in egg production than pullets.

Five years' management tests with chicks and pullets, D. C. KENNARD and V. D. CHAMBERLIN (*Poultry Sci., 15 (1936), No. 3, pp. 230–234*).—From studies at the Ohio Experiment Station data are presented on the egg production and the degree of mortality of groups of pullets confined, allowed access to fresh range, and access to old or used range. No significant difference in mortality was noted among these groups, while pullets on fresh range produced more eggs. Tests were also conducted in which healthy layer pullets were imported from healthy flocks and compared with similar strains in the station flock, both when kept in separate lots and when mixed with the station pullets. In every case mortality was less and egg production was greater for the imported pullets than for those raised at the station. Suggestions are made regarding the shortcomings of sanitary measures as a means of controlling such diseases as paralysis, leucosis, typhoid, and cholera-like diseases, and the possibility of eliminating infection by removing all infected and carrier individuals from the premises periodically and making a fresh start.

The selection and management of turkey breeders, D. R. MARBLE and P. H. MARGOLF (*Poultry Sci., 15 (1936), No. 3, pp. 225–229*).—In a 3-yr. study at the Pennsylvania Experiment Station, eggs produced by turkeys on limited range gave better hatchability than those from turkeys in confinement, though total egg production was not greatly influenced. Both fertility and hatchability greatly decreased with advance of season from March until July. Medium-sized eggs (from 84 to 89 g) gave a higher percentage hatch than either extremely large or small eggs. Pullets produced more eggs than yearling hens, with no particular difference noted in either fertility or hatchability of the two lots.

The relationship of protein supplement to interior egg quality, D. F. SOWELL and C. L. MORGAN (*Poultry Sci., 15 (1936), No. 3, pp. 219–222*).—This study at the South Carolina Experiment Station involved the use of four different mash rations each fed to duplicate groups of pullets under ordinary housing conditions and confined in individual laying cages. The housed pullets received a grain mixture in addition, while the caged birds received only the mash ration. Monthly egg samples (three consecutively laid eggs) were taken for study, which included weight, width, and height of yolk, color of yolk, and weight of the thick white. It appeared that the source of protein supplement fed had no material effect on the interior physical quality of the eggs produced.

Further studies on the effect of sources of vitamin D in the diet of the chicken on storage of the antirachitic factor, G. M. DE VANEY, H. E. MUNSELL, and H. W. TITUS (*Poultry Sci., 15 (1936), No. 2, pp. 149–153*).—Continuing this investigation (E. S. R., 70, p. 372), a study was made of the effect of adding varying quantities of vitamin D from either cod-liver oil or viosterol, but mixed with corn oil in such proportion that 8 percent of fat was added to the diet in each case. This level of fat in the diet apparently exerted no inhibiting effect on vitamin D storage, which amounted to about 2 percent of the amount ingested when 2 and 4 percent of cod-liver oil or 8 percent of viosterol 5D was fed. The percentage retention was somewhat lower when 8 percent of cod-liver oil or 2 or 4 percent of viosterol 5D was fed. The number of eggs per bird was quite similar in all trials except in the case of those receiving 8 percent of cod-liver oil, where egg production was markedly decreased.

Poultry culture in the Salt River Valley of Arizona, B. W. HEYWANG (*U. S. Dept. Agr., Bur. Anim. Indus., Anim. Husb. Div., 1935, A. H. D. No. 15, pp. 3*).—Poultry production in Arizona, including problems in feeding, housing, diseases, and marketing of products, is discussed.

Poultry specialty clubs (*U. S. Dept. Agr., Bur. Anim. Indus., Anim. Husb. Div., 1936, A. H. D. No. 18, pp. 2*).—The names of poultry specialty clubs, together with the name and address of the secretary of each club, are listed.

Some causes and effects of a high free fatty acid content of the meat-scraps in poultry rations, C. H. SCHROEDER, G. K. REDDING, and L. J. HUBER (*Poultry Sci., 15 (1936), No. 2, pp. 104–114, figs. 3*).—This contribution describes a series of chick feeding tests to determine the effect of rations containing meat scraps of high or low free fatty acid content, both before and after extraction of the fat and with and without vitamin A and D supplements.

In every instance feeding meat scraps of high free fatty acid content gave inferior results to those secured from low free fatty acid rations. Extracting the fat did not materially improve the results from the former, while adding this extracted fat to the latter rations did not decrease their efficiency. This addition of vitamin A and D supplements, particularly the former, greatly improved results from the high free fatty acid ration, indicating that inactivation of these vitamins resulted when a high percentage of free fatty acid is present. The effect of storage conditions on the rate of development of free fatty acid is discussed.

Shell characteristics and their relationship to the breaking strength, G. F. STEWART (*Poultry Sci., 15 (1936), No. 2, pp. 119–124, figs. 2*).—This study from Cornell University describes certain new measurements considered desirable in determining egg shape. It was found that there was very little relation between shape of eggs and their breaking strength, while a correlation of 0.509 ± 0.028 was found between shell thickness and breaking strength.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle and dairy products in Indiana] (*Indiana Sta. Rpt. 1935, pp. 27–33, 53, 57, 58*).—Results are noted on the value of legume hay and cracked corn as a ration for growing dairy calves and as a winter ration for yearling dairy heifers, the value of alfalfa hay and ground shelled corn as a ration for dairy cows, the fat test of milk as affected by soybean products, factors in soybeans responsible for the suppressing action in vitamin A formation in butter, the effect of feeds upon the vitamin A content of butter with special reference to the rapidity of change in the vitamin A activity of such butter, and the vitamin A potency of carotene fed in butterfat and Wesson oil.

Investigations with dairy products yielded information on the vitamin A activity of butter produced by cows fed alfalfa hay and soybean hay cut in different stages of maturity; the relationship between carotene, color, and vitamin A in butter; the enzymes in sweet and sour farm-skimmed cream as related to keeping quality of the butter; the effect of H-ion concentration and season of the year upon the keeping quality of butter as manufactured under commercial conditions; physical, chemical, and bacteriological factors affecting the body, texture, and quality of ice cream; the character of Indiana butter from the standpoint of quality; the cause and remedies of some abnormal flavors in milk with special reference to cappy flavor; the methods used in washing and sterilizing milking machines; grading cream for butter making; milk quality improvement; and the change in vitamin A activity of butter following a change in the vitamin A intake of cows.

Growth and development with special reference to domestic animals, XXXVIII, XXXIX, S. BRODY and R. CUNNINGHAM (*Missouri Sta. Res. Buls. 238 (1936), pp. 52, figs. 5; 239 (1936), pp. 47, figs. 17*).—This is a continuation of this series of studies (E. S. R., 74, p. 828).

XXXVIII. *Further studies on the energetic efficiency of milk production and the influence of live weight thereon.*—Continuing the line of investigation as noted (E. S. R., 73, p. 663), data on milk production, feed consumption, live weights, and weight gains were analyzed on four groups of high-producing cows, totaling 368 individuals. The results of these analyses showed a range of energetic efficiency for milk production for the different groups from 28 to 34.4 percent (the previous report indicated this to be of the order of 30 percent for good cows), with evidence that this factor is practically independent of live weight. Two champion milk producers, a Holstein weighing 1,700 lb. and a Jersey weighing 700 lb., were shown to have very high energetic efficiency, amounting to 43.5 and 47.5 percent, respectively, the latter figure probably nearing the limit of biological possibility. The applicability of the law of diminishing returns to the gross and net costs of milk production is fully discussed, and curves are presented to indicate that successive efficiency increments decline exponentially with successive milk increments in their approach to a theoretical maximum efficiency of about 60 percent. A marked similarity is noted for the energetic efficiency of milk production for "good" cows, regardless of live weight and the gross efficiency of early postnatal growth on "good" diets for different species of animals regardless of size, namely, about 30 percent.

XXXIX. *Relation between monetary profit and energetic efficiency of milk production with special reference to the influence of live weight thereon.*—This phase of the investigation is introduced by pointing out that energetic efficiency of milk production is the ratio of the energy output as milk to the energy expended as digestible feed, whereas monetary profit of milk production is the difference between money realized for milk produced and money expended for the feed consumed, and the fact is emphasized that these two factors cannot be considered as identical. The question is raised as to whether profits should be computed on the basis of a cow, a unit of live weight, a unit of milk produced, or a unit of feed consumed, and what influence live weight has on each of these varieties of profit.

Based on analyses of extensive data, it is concluded that profit per cow increases with increasing size of cow. Profit per unit of live weight decreases with increasing size, while profit per unit of milk produced and per unit of feed consumed tends to be independent of the size of the animal and almost directly proportional to gross energetic efficiency of milk production, which factor is considered the only logical measure of physiological dairy value. Nomographs are presented for estimating gross energetic efficiency for various levels of live

weight and milk production and for estimating the several kinds of profit described based on given prices for milk and feed.

Influence of preceding dry period and of mineral supplement on lactation, P. T. D. ARNOLD and R. B. BECKER (*Jour. Dairy Sci., 19 (1936), No. 4, pp. 257–266, figs. 3*).—An analysis of milk production records at the Florida Experiment Station indicated that a dry period of from 31 to 60 days allowed maximum milk yield in Jersey cows, while a dry period of less than 30 days resulted in an early decline. A dry period of over 91 days appeared to result in lower milk production. Analysis of records made before and after bonemeal was fed at the rate of 2 percent of the grain ration indicated that a 45-percent increase in milk production resulted from the bonemeal feeding, with significantly greater persistence noted in the bonemeal group.

The influence of rations low in certain minerals on the composition of the blood and milk of cows and on the blood of their progeny, J. W. GROENEWALD (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 4 (1935), No. 1, pp. 93–165, figs. 16*).—This study involved the use of 12 yearling Friesland heifers and extended over a 30-mo. period. All animals received the same low mineral basal ration, with various mineral supplements allowed so that the ration of each pair, except the control animals, was deficient in at least one essential mineral. Extensive tables and curves present the mineral content of the blood and milk of the cows and of the blood of their offspring from birth to 85 days of age.

Mineral-deficient rations were not reflected in abnormal blood analysis except in the case of low phosphorus intake, which caused a subsequent lowering of inorganic blood phosphorus, ultimately causing death of the animal.

The composition of the milk was definitely not influenced by the character of the ration. Significant changes were noted to occur in the mineral content of the blood of calves from 1 to 3 mo. of age.

The effect of intravenous injections of sugar upon the lactating bovine, W. R. BROWN, W. E. PETERSEN, and R. A. GORTNER (*Jour. Dairy Sci., 19 (1936), No. 3, pp. 177–184, figs. 2*).—The Minnesota Experiment Station has studied the effect of injecting varying quantities of isotonic solutions of different sugars into the blood stream of lactating cows on the blood sugar content and on the lactose content of milk. Glucose injection tended to cause a slight hypoglucemia, followed by a marked hyperglucemia and a later drop to subnormal levels. Fructose injections caused a more pronounced hypoglucemia, while only lactose injections caused a pronounced hyperglucemia of considerable duration. Any increases in lactose secretion following these injections were so slight and so variable as to be of little significance, indicating that this procedure is of doubtful value in a study of lactose synthesis.

Intra-mammary duct injections in the study of lactose formation, W. R. BROWN, W. E. PETERSEN, and R. A. GORTNER (*Jour. Dairy Sci., 19 (1936), No. 4, pp. 243–256, figs. 11*).—The object of these experiments at the Minnesota Experiment Station was to produce a hyperglucemic condition in milking cows and, succeeding in this, to determine its effect on lactose secretion.

Eleven tests are reported in which varying concentrations of different sugar solutions were injected into the right half of the mammary gland of cows immediately following a normal milking period and in amounts practically equal to the amount of milk removed. It is concluded that such intramammary duct injections will produce a hyperglucemia providing that sufficient sugar is injected. Since increased insulin activity is stimulated by the inflow of sugar into the blood, injection of smaller quantities of sugar actually resulted in hypoglucemia.

Marked tremors were produced in the majority of the cases, closely followed by a marked rise in the blood sugar and increased body temperature, and accompanied by pronounced diuresis. The hyperglucemic condition resulted in only slightly increased lactose secretion, indicating that the optimum level of lactose secretion is very close to the maximum.

A note on the comparative economic efficiency of the Indian cow, the half-bred cow, and the buffalo as producers of milk and butter fat, K. P. R. KARTHA (*Agr. and Livestock in India, 4 (1934), No. 6, pp. 605–623, fig. 1*).—This contribution presents extensive data on the average milk and butterfat production of various strains of native Indian cattle, half-bred cows, and buffalos, with statistical constants for the distribution of milk yield among the various classes. Data are also presented on the comparative frequency of abortion among the various classes.

Studies on economy of milk production show that the buffalo, although not possessing the latent milking qualities of either the native Indian cow or the half-bred cow, is well adapted for the native villager where cheap grazing is available. Under conditions of high roughage cost the half-bred cow excels either the native cow or the buffalo.

The effect of early breeding upon the milk energy production of grade and purebred Toggenburg goats, O. C. CUNNINGHAM and L. H. ADDINGTON (*Jour. Dairy Sci., 19 (1936), No. 6, pp. 405–409; abs. in New Mexico Sta. Press Bul. 792 (1936), p. 1*).—Data are presented to show that a group of milk goats which first freshened at from 11 to 14 mo. of age and were milked only from 5 to 7 mo. during the first lactation produced slightly more milk as 2-year-olds (second lactation) than a similar group which freshened for the first time at about 2 yr. of age.

The results indicate that it is feasible to hasten the increase of the number of generations of female goats and the size of the herd by breeding the does to freshen for the first time at from 11 to 14 mo. of age.

Observations on the occurrence of supernumerary teats in dairy cattle, T. T. DAVID (*Philippine Jour. Anim. Indus., 2 (1935), No. 5, pp. 319–325, pls. 2, fig. 1*).—This article from the University of the Philippines notes that of 104 cows examined 23.07 percent had supernumerary teats. The caudal type was most commonly observed, being present in 66.6 percent of the individuals having extra teats. In all, 11 different patterns of extra teats were observed.

Simple versus complex ration for winter feeding of dairy cows, R. E. HORWOOD and J. G. WELLS, JR. (*Michigan Sta. Quart. Bul., 18 (1936), No. 4, pp. 248–253*).—In order to compare a simple and a complex ration for dairy cows two trials were conducted with two groups of four cows each, using the double reversal system of feeding. In the first trial a ration of mixed hay and ground corn was compared with a ration of mixed hay, sunflower silage, roots, and a grain mixture. In the second trial the simple mixture consisted of alfalfa hay and ground barley and the complex ration of alfalfa hay, roots, and a grain mixture.

In the first trial the cows on the complex ration produced 5.6 percent more 4-percent fat-corrected milk than when on the simple ration. On the complex ration the animals lost 206 lb. but gained 389 lb. in weight on the simple ration. During the second trial the complex ration increased the yield of 4-percent fat-corrected milk 12 percent. However, the simple ration put 335 lb. of gain on the cows, while they gained only 56 lb. on the complex ration. During both trials the cows consumed 414.5 lb. more digestible protein and 298.5 lb. less total digestible nutrients while receiving the complex ration.

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Legume hay with and without high protein concentrates for dairy cows, J. H. HILTON, J. W. WILBUR, and W. F. EPPLE (*Indiana Sta. Bul. 407 (1936), pp. 4, fig. 1*).—Using the double reversal method of feeding four trials, divided into three 30-day experimental periods each, were conducted. Soybean hay was fed in the first two trials and alfalfa hay in the last two. The hay was the only source of roughage and was fed at the rate of 2 lb. per 100 lb. of live weight. In addition one group of cows in each test received a grain mixture of 400 lb. of ground corn and 200 lb. of ground oats, while the second group had the same mixture plus 50 lb. of linseed oil meal. The grain was fed at the rate of 1 lb. for each 3 lb. of milk produced.

There was no significant difference in the milk and butterfat production, feed consumption, or body condition between the groups of cows. It was shown that good average milk production could be maintained by liberal feeding of good quality of legume hay supplemented by a grain mixture of corn and oats. For high-producing cows or when the hay was of inferior quality it was suggested that some protein supplement may be needed. No minerals were fed in these trials, but it was thought that it might be wise to add 2 lb. of steamed bonemeal to each 100 lb. of the corn and oats mixture or to substitute wheat bran for part of the oats in order to keep up the phosphorus content of the ration.

The digestibility and feeding value of Russian thistle hay, H. W. CAVE, W. H. RIDDELL, and J. S. HUGHES (*Jour. Dairy Sci., 19 (1936), No. 4, pp. 285–290*).—The results of this study at the Kansas Experiment Station show that Russian-thistle hay is high in protein and ash but relatively low in total digestible nutrients as compared with other nonlegume roughages.

In a feeding trial it was demonstrated that the thistle hay was inferior to alfalfa, supplying 44.1 percent of the total digestible nutrients in the ration as compared with 56.3 percent supplied by alfalfa. The thistle hay was much less palatable, and furthermore it had to be ground because of the coarse spiny nature of the plant. No appreciable off flavors or odors developed in the milk produced.

Calcium and phosphorus requirements of dairy cows.—III, Relative values of dicalcium phosphate and bone meal as mineral supplements, J. A. NEWLANDER, H. B. ELLENBERGER, and C. H. JONES (*Vermont Sta. Bul. 406 (1936), pp. 16*).—Continuing this study (E. S. R., 68, p. 370), two cows have been kept continuously on mineral balance trials over two complete lactation periods. Each cow received Dicapho, a commercial dicalcium phosphate, during the first lactation period and steamed bonemeal during the second period, one animal receiving the supplements continuously while the other one was alternated for periods of from 6 or 9 weeks with and without them.

Making allowance for differences in the rate of mineral intake and the total quantities of milk produced, these two supplements, when fed at the rate of 100 g daily per cow, proved to be practically equal in calcium and phosphorus assimilability.

The effect of type of feed on the solids-not-fat content of milk, L. L. ROUX, G. N. MURRAY, and D. J. SCHUTTE (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 4 (1935), No. 1, pp. 167–197, figs. 2*).—In this investigation three groups of six cows each were fed a heavy concentrate ration, a heavy dry roughage ration, and a heavy succulent ration, respectively. Extensive tables are presented to show the feed consumption, live weight, milk production, butterfat and solids-not-fat content of milk, and a statistical analysis of these data.

The heavy concentrate ration maintained a higher level of production, a normal trend for solids-not-fat, and a slow increase in percentage of butterfat with advance in lactation. The other rations, both giving similar results, ap-

peared to have a depressing effect on the percentage of solids-not-fat, and milk production dropped more rapidly and the percentage of butterfat increased to a greater extent than occurred in the heavy concentrate group.

Taint in milk during the feeding of molassed beet pulp, H. T. CRANFIELD and J. MACKINTOSH (*Jour. Min. Agr. [Gt. Brit.], 42 (1935), No. 6, pp. 551–560*).—In a series of feeding experiments in which several lots of molasses beet pulp were fed to milking cows it was demonstrated that certain lots gave rise to a taint in milk flavor ranging from a mild off flavor to a decidedly fishy flavor. This condition occurred in only a few lots but apparently was most likely to come from dark-colored pulp. It is suggested that certain nitrogenous compounds occurring in beet pulp, capable of being broken down to produce trimethylamine, are the cause of this fishy taint.

Raising dairy calves, L. L. ROUX (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 4 (1935), No. 2, pp. 495–539, figs. 42*).—This is a report of a comparative feeding test in which a group of Friesland calves reared to 6 mo. of age on a limited quantity of whole milk, a specially compounded calf meal mixture, and alfalfa hay was compared with a similar group of calves receiving whole milk, skim milk, a simple grain mixture, and hay. These two groups respectively consumed 527 and 333 lb. of whole milk, 0 and 1,738 lb. of skim milk, 388 and 364 lb. of dry concentrate mixture, and 529 and 529 lb. of hay, and at 6 mo. of age were 85- and 113.2-percent normal in weight and 99.1- and 99.9-percent normal in height. Both groups made satisfactory growth on pasture after 6 mo. of age. While the milk substitute ration did not prove as efficient as the skim milk ration, both are considered suitable and economical.

Factors affecting the composition of milk, C. W. TURNER (*Missouri Sta. Bul. 365 (1936), pp. 30, figs. 10*).—In this bulletin the author has compiled the existing information on the composition of the milk of various animals, variations between breeds and individuals, the relation between fat and other constituents of milk, and the nutritional, physiological, and managerial factors affecting the composition of milk.

Butterfat and total solids in New England farmers' milk as delivered to processing plants, M. S. JACOBSON (*Jour. Dairy Sci., 19 (1936), No. 3, pp. 171–176, figs. 3*).—The author has examined over 100,000 samples of milk delivered to New England milk plants. He shows that for each 0.1-percent increase in butterfat there is a corresponding increase of 0.04 percent in solids-not-fat, with only slight seasonal variations in this relationship.

It is pointed out that milk meeting the Massachusetts minimum legal requirement for butterfat (3.35 percent) was below the standard (12 percent) for total solids. The desirability of two legal standards, one to cover milk sold by the producer to the dealer and the other to cover milk sold to the consumer, are discussed.

Normal variations in the curd tension of milk, W. H. RIDDELL, W. J. CAULFIELD, and C. H. WHITNAH (*Jour. Dairy Sci., 19 (1936), No. 3, pp. 157–164*).—The Kansas Experiment Station has investigated the effect of a number of factors on the curd tension of milk as measured by a modification of the Hill test. Considerable daily variation in the test of individual cows was noted, with coefficients of variation over a 10-day period ranging from 23.5 for a cow averaging 19.1 g to 7.5 for a cow averaging 83.5 g.

Colostrum was found to have a relatively high curd tension, reaching an average maximum on the third day after parturition. A rapid decline in firmness of curd was noted from the third to the tenth day, with a gradual decline beyond this point until the lowest curd tension was reached during the second and third months of lactation, followed by a gradual rise to the end of the

lactation period. Breed was found to be an important factor, and in order of softness of curd ranked Holstein, Ayrshire, Guernsey, and Jersey in this study.

A study of the titratable acidity of milk, I, II, W. J. WILEY (*Jour. Dairy Res. [London], 6 (1935), No. 1, pp. 72–85, figs. 10; 86–90, figs. 3*).—Two studies are reported from the Government Chemical Laboratory, Brisbane.

I. *The influence of the various milk buffers on the titration curves of fresh and sour milk.*—Simple solutions containing the various buffers naturally occurring in milk were studied as a means of determining the effect of each on the milk titration curve, when titrated to the phenolphthalein end point with sodium hydroxide. Titrations were made within definite pH ranges, using pH 4.8 to 8 as simulating sour milk and 6.6 to 8 as typical of fresh milk. Curves are presented to show the order of magnitude of the changes in the titration caused by each of the main buffer constituents. Within the pH 4.8 to 8 range increasing the concentration of either phosphorus, calcium, or casein increased the titration, while citrate concentration had very little effect. In the pH 6.6 to 8 range increasing the phosphate or citrate increased the titration, while increased calcium or casein slightly decreased it. Apparently each of the constituents has a decided effect on the equilibrium and changes the formation of the titration curve in a manner which cannot be predicted from its individual curve.

II. *The "buffer curves" of milk.*—In the second study typical buffer curves are presented for solutions of phosphate, citrate, and casein, and a combination of the three, in comparison with the normal milk curve and the curve for a solution containing calcium in addition to the first three constituents. The two latter curves practically coincide and are very dissimilar to the former group, indicating the pronounced effect of calcium on the titration. Other curves show the relation of milk and acid whey, with the conclusion that the differences are due to the influence of casein on the calcium phosphate equilibrium. The study emphasizes the interdependence of the buffers phosphate, citrate, casein, and calcium.

Some factors influencing the acidity of freshly drawn cows' milk, W. J. CAULFIELD and W. H. RIDDELL (*Jour. Dairy Sci., 19 (1936), No. 4, pp. 235–242, fig. 1*).—The Kansas Experiment Station made a study of the titratable acidity of freshly drawn milk from all cows in the station herd over a 14-mo. period.

The average acidity was 0.16, 0.161, 0.172, and 0.179 percent for Ayrshires, Holsteins, Guernseys, and Jerseys, respectively, with 80 percent of the samples of any one breed falling within a range of 0.06 percent. The colostrum milk was high in acidity and declined rapidly for the first few milkings with a more gradual decline for the first 15 to 20 days. The acidity was quite constant from the second to the seventh month of lactation, with a marked drop observed during the last month of the lactation period. Average variations from day to day or from milking to milking were not significant.

A statistical examination of the interrelationship and variability of plate count, presumptive coliform content, and keeping quality of raw milk, H. BARKWORTH (*Jour. Dairy Res. [London], 6 (1935), No. 1, pp. 26–48, figs. 3*).—A linear relationship is noted between plate count and keeping quality, but nonlinearity occurs in those relationships concerning coliform content. In general it appears that the variability is too great for practical purposes to permit the forecasting of either term from results of the other two.

An aerobic acid-fast Actinomyces in cow's milk due to an udder infection, J. D. A. GRAY (*Jour. Dairy Res. [London], 6 (1935), No. 1, pp. 49–55, figs. 3*).—The author reports on the isolation of a pure culture of *Actinomyces*, not previously described, which was secured from an abscess developing in a guinea pig inoculated with milk from the infected bovine udder. The morphology, stain

reaction, culture, heat resistance, and pathogenicity of the organism are presented.

Results of bacteriological survey of milk jugs and milk bottles, S. V. LAYSON, E. G. HUFFER, and J. M. BRANNON (*Milk Plant Mo., 25 (1936), No. 2, pp. 34–36, 90*).—This survey of milk-distributing plants in Illinois showed wide variation in the sanitary condition of milk jugs and milk bottles, not only in the different plants but within a single plant, and with only a few showing uniformly low counts in all milk containers. Thirty percent of all milk jugs and 14.5 percent of all bottles examined showed the presence of gas-forming organisms, while only 35.6 percent of the jugs were sufficiently clean to have added only one bacterium or less per cubic centimeter of capacity.

An inquiry into the design, operation, and efficiency of pasteurising plants, A. W. SCOTT and N. C. WRIGHT (*Hannah Dairy Res. Inst. Bul. 6 (1935), pp. 72, figs. 15*).—This is a report of a survey of 19 pasteurizing plants using "holding" type pasteurizers.

The discussion covers the design and operation of pasteurizing plants, with particular reference to the types of heaters and the mechanism for holding, the treatment of milk subsequent to pasteurization, and the bacteriological control of the plants. Appendix sections show the efficiency of pasteurizing in the different plants in relation to the destruction of *M[ycobacterium] tuberculosis* and the phosphatase tests as a means of detecting inefficient pasteurization.

Effect of a milk plant quality program on the price paid to producers for milk, V. C. MANHART (*Indiana Sta. Bul. 404 (1936), pp. 12, figs. 2*).—A milk plant using a milk quality program was studied over a period of 4 yr. to determine the equitableness of the program to producers. The program was based on a grading system determined by flavor, the methylene blue test, and the sediment test.

Payments for premium grade increased from 28 percent of the total payments made the first year to 64.3, 63.3, and 66.2 percent, respectively, in the succeeding years. The producers received an average yearly net return for the 4-yr. period of 4.65 ct. more per pound of milk fat for premium grade milk than the average prevailing competitive price in the same milk area, while regular grade milk was 0.35 ct. higher and low grade milk 3.87 ct. lower. The milk plant had an average cost of 2.32 ct. more per pound of milk fat under the program than if it had purchased the milk at market price, and the additional cost did not include the expense of operating the program.

New producers admitted to the market after the first year of the program received the highest premium payments, while the second highest payments were received by the producers who sold milk during the entire period. Premium grade payments according to seasons were (1) autumn, 72.8 percent; (2) winter, 85.6; (3) spring, 75.4; and (4) summer, 29.9 percent. Undesirable flavors became important during the months of April to September and reached a peak of 9.3 percent of the total volume of milk in August. The results showed that the program was equitable to all producers and decidedly advantageous to a large majority of them.

Milk quality improvement effected at the farm by a plant program, V. C. MANHART and A. V. MOORE (*Indiana Sta. Bul. 405 (1936), pp. 16, figs. 3*).—Continuing the above study, it was found that the program effected a decided improvement in the quality of the milk as shown by the tests employed. The payment of a premium for first grade milk with proper price differentials between grades was responsible for the improvement.

Of the 14 producers who sold milk during the entire period of observation, the seven with the poorest quality at the beginning increased their average score 20.8 points and attained a quality equal to the other seven, who increased their

score only 7.9 points. The producers who sold milk from the beginning had a product superior in quality to those who quit before the end. The poorest quality milk was sold by the producers who quit during the first year of the program. The sediment test was responsible for 58 percent of the increase in total score, while the methylene blue test accounted for 42 percent.

As a result of the program, the milk plant received a better quality milk, which sold for 1 ct. higher per quart than the prevailing price for pasteurized milk. The consumer received a good quality milk of pleasing flavor with a total bacterial count of less than 10,000 per cubic centimeter after pasteurization and at the time of delivery, and the producer received a premium of about 4.5 ct. per pound of milk fat over the prevailing price paid in the territory.

The neutralisation of cream for butter-making, W. J. WILEY (*Jour. Dairy Res. [London], 6 (1935), No. 1, pp. 91–102, figs. 4*).—This discusses the theoretical aspects of cream neutralization with reference to acid base equilibria.

Experimental results are presented to show that when milk of lime is the neutralizer, pasteurization has little effect on the pH or titratable acidity of the cream. The degree of reduction in acidity due to lime neutralization as compared with the theoretical reduction, based on sodium hydroxide titration, is lowest at a pH range of 5.6 to 5.8. It gradually increases until 6.5 is reached, beyond which the two follow parallel courses.

When sodium bicarbonate is used as the neutralizer the loss of carbon dioxide has a pronounced influence on the degree of neutralization. With flash pasteurization there was practically complete neutralization, while with raw cream of low acidity neutralization was less than 50 percent of the theoretical.

Variations in pH titratable acidity relationship of cream neutralized with calcium hydroxide and sodium bicarbonate are defined.

Observations on the freezing of milk and cream.—II, The destruction of the fat emulsion in frozen cream, F. J. DOAN and F. B. BALDWIN, JR. (*Jour. Dairy Sci., 19 (1936), No. 4, pp. 225–233, figs. 4*).—Continuing this series of studies at the Pennsylvania Experiment Station (E. S. R., 74, p. 690), samples of pasteurized cream containing 40 and 25 percent of fat and 40 percent of fat plus 10 percent of sucrose, respectively, were frozen in 2-qt. containers in still air at —23° to —28° C. After complete solidity was reached the amount of fat de-emulsified amounted to 80 percent, 30 percent, and 15 percent for these respective samples.

A marked similarity was noted between the percentage of fat de-emulsified and the maximum pressure developed within the mass during freezing. The fat aggregates developed in freezing appeared identical with those developed by churning. The stability of the proteins in cream when frozen is a minor factor in aiding or preventing de-emulsification of the fat.

Effect of lipolysis on the churnability of cream obtained from the milk of cows in advanced lactation, V. N. KRUKOVSKY and P. F. SHARP (*Jour. Dairy Sci., 19 (1936), No. 4, pp. 279–284*).—This experiment from the [New York] Cornell Experiment Station demonstrated that the difficult churning and abnormal foam formation from the milk of cows in advanced lactation can be practically prevented by the pasteurization of the milk or cream shortly after it is produced, and that less difficulty is encountered when the cream is separated when warm rather than when fat globules are in a solid state. This abnormal condition of milk is probably due to the presence of fatty acids and soaps resulting from lipolytic action, and the difficulty of churning is not only affected by the accumulated fatty acids but also by the rapid increase in fat hydrolysis during the churning process.

A study of fat splitting and casein digesting bacteria isolated from butter, C. N. STARK and B. J. SCHEIB (*Jour. Dairy Sci., 19 (1936), No. 3, pp.*

191–213).—The [New York] Cornell Experiment Station has made a study of those organisms which could be isolated from butter which possess the ability to hydrolyze milk fat, split tributyrin, or decompose the casein of milk. A total of 486 cultures of bacteria was isolated from butter made and stored under controlled conditions. The organisms were grouped as follows: Gram-negative rods, 39 percent; Gram-positive cocci, 31; Gram-positive, aerobic, spore-producing rods, 15; Gram-negative micrococci, 8; Gram-positive sarcina, 5; and Gram-positive, nonspore-producing rods, 2 percent. The first-named group regularly occurred in all butters tested and except the second and third groups in large enough numbers to be of probable significance in the spoilage of butter.

Tables are presented to show various physiological reactions of the different groups. New names are suggested, and the morphological and physiological properties are summarized for five species of bacteria.

The effect of certain factors upon the keeping quality of butter, E. S. GUTHRIE, B. J. SCHEIB, and C. N. STARK (*Jour. Dairy Sci., 19 (1936), No. 4, pp. 267–278*).—In this study from the [New York] Cornell Experiment Station the effect of natural milk enzymes, bacteria, acid, and salt on the keeping quality of butter was determined from a total of 576 samples made and stored under known and controlled conditions.

Milk enzymes having a harmful effect were not destroyed by pasteurization at 145° F. for 30 min., but were destroyed at 165° for the same period. Such enzymes are not inhibited by salt but were definitely inhibited by pH 4.7 or less. Pasteurization at 165° for 30 min. destroyed all bacteria of importance in butter spoilage, and the action of both salt and acid definitely inhibited bacterial growth. In the absence of other spoilage factors a direct correlation seemed to exist between the number of fat-splitting and casein-digesting bacteria and the keeping quality of the butter. The presence of either acid or salt or the combined action of the two exerted a deteriorating effect.

Use of hydrogen ion determination on young cheese in predicting acid development in Cheddar cheese during storage, D. W. SPICER and L. H. BURGWALD (*Natl. Butter and Cheese Jour., 26 (1935), No. 21, pp. 14, 16, 33, 34*).—In a study at Ohio State University both titratable acidity and H ion were determined at various stages of manufacture in several lots of American cheese made under known and controlled conditions, and pH determinations were made on these as well as a large number of commercial cheeses during the third to tenth day of storage.

No apparent advantage was found in using pH determinations instead of the common titration test for determining acid during manufacture. There is a close relation between the degree of acidity at the time of milling and the amount of acid that develops during storage, and pH determinations made on the cheese from the third to the tenth day in storage give an accurate indication of the acidity which will ultimately develop in storage. A pH of 5.07 was about the dividing line between cheese that did or did not develop acid during storage.

Bitter flavor in Cheddar cheese, W. V. PRICE (*Jour. Dairy Sci., 19 (1936), No. 3, pp. 185–190, fig. 1*).—The Wisconsin Experiment Station has made a study of 178 lots of experimental cheese, 37 of which were adjudged as having a bitter flavor. This lot was found to have several characteristics in common with those developing a slight overacidity, leading to the conclusion that bitter flavor is associated with this condition. Further study has shown that a high correlation exists between the acidity of the curd either at the time of cutting, dipping, or milling and the pH value of the cheese at 3 days of age. Limiting the development of acidity during the curd-making operations should result in a lower incidence of bitter flavor in cheese.

VETERINARY MEDICINE

[Report of work in veterinary medicine by the Indiana Station] (*Indiana Sta. Rpt. 1935, pp. 59–63*).—The work of the year referred to (E. S. R., 73, p. 236) includes studies of the death loss in newborn pigs, the relation of fungus development on cornstalks and grain to livestock poisoning, encephalitis in horses, immunization studies of Bang's disease and of brucelliasis in bulls, the agglutination test for Bang's disease, and diagnoses made of animal diseases.

[Parasites of domestic animals in Puerto Rico] (*Puerto Rico Sta. Rpt. 1935, pp. 23–26*).—Included in this report (E. S. R., 73, p. 537) is a host list of the lice infesting domestic animals, including birds, in Puerto Rico and in the continental United States and a similar host list of the parasitic mites. Reference is made to several new protozoan parasites of domestic animals reported from Puerto Rico for the first time, particularly Coccidia, mention being made of *Eimeria faurei* in the goat. Reference is also made to several diseases limiting Puerto Rican poultry production, which include coccidiosis and blackhead; to the brown dog tick as the only vector of piroplasmosis of dogs, the chronic form of which has been encountered; and to anaplasmosis in cattle.

Ectoparasites of domestic animals observed in the State of São Paulo [trans. title], Z. Vaz (*Arch. Inst. Biol. [São Paulo], 6 (1935), pp. 29–33; Eng. abs., p. 33*).—A host list is given of the ectoparasites of domestic animals in the State of São Paulo, Brazil, presented with 15 references to the literature.

An attempt to transmit anaplasmosis by biting flies, H. Morris, J. A. Martin, and W. T. Oglesby (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 2, pp. 169–175*).—In work at the Louisiana Experiment Station, 3 animals that were exposed to intermittent feeding of the black horsefly failed to develop the disease in 80 days. One preliminary test with this fly proved positive in 25 days. Three animals exposed to intermittent feeding of the horn fly failed to develop the disease in 100 days. Three animals exposed to intermittent feeding of *Tabanus fuscicostatus* Hine failed to develop the symptoms in 80 days. All 9 exposed animals were known to be susceptible because all developed the disease when given intravenous injections of virulent blood. No attempt is made to explain why these results are different from those reported from Oklahoma (E. S. R., 67, p. 453) and Florida (E. S. R., 70, p. 530).

Transmission of Aujeszky's disease to the rabbit by the external auditory canal [trans. title], P. Remlinger and J. Bailly (*Compt. Rend. Soc. Biol. [Paris], 119 (1935), No. 24, pp. 937–939*).—Two experiments reported have shown the virus of Aujeszky's disease to be transmissible through the external auditory canal, in addition to the nares, conjunctiva, and rectum, and by ingestion as previously demonstrated.

Vitamin G from different sources and coccidian infection, E. R. Becker and N. F. Morehouse (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 4, pp. 437–439*).—The experiments reported, conducted with *Eimeria miyairii* on rats, have shown that coccidium growth is tied up with the vitiman G complex. When yeast or certain other materials are employed as a source of this vitamin, the growth of this parasite is stimulated. Liver as a source of the vitamin does not favor the development of the coccidian.

Inoculability of certain neurotropic viruses (herpes, poliomyelitis) by the external auditory canal [trans. title], C. Levaditi and J. Vieuchange (*Compt. Rend. Acad. Sci. [Paris], 200 (1935), No. 21, pp. 1800, 1801*).—The three experiments reported have shown that it is possible to produce a herpetic encephalitis in the rabbit by depositing a suspension of the virus in the external auditory canal.

Inoculability of certain neurotropic viruses (herpes, in particular) by the external auditory canal [trans. title], C. LEVADITI and J. VIEUCHANGE (*Compt. Rend. Soc. Biol. [Paris], 119 (1935), No. 24, pp. 949–951*).—A further contribution supplementing that above noted.

Onchocerciasis, with special reference to the Central American form of the disease (*Cambridge, Mass.: Harvard Univ. Press, 1934, pp. XIV+234, pls. [9], figs. [101]*).—Part 1 of this work, by R. P. Strong, deals with onchocerciasis, with special reference to the Central American form of the disease (pp. 1–132); part 2, by J. H. Sandground, considers the validity of the various species of the genus *Onchocerca* Diesing (pp. 133–172); part 3, by J. C. Bequaert, consists of notes on the blackflies or Simuliidae, with special reference to those of the *Onchocerca* region of Gua'emala (pp. 173–224); and part 4, by M. Muñoz Ochoa, presents some epidemiological facts about the onchocerciasis of Guatemala (pp. 225–234). Quite complete bibliographies are included in the first three contributions.

It is pointed out by Sandground that the genus *Onchocerca* was created by Diesing in 1841 for a parasite, to which the name *O. reticulata* was given, found in the suspensory ligament of the fetlock of a horse in Wien (Vienna), Austria. A catalog which is given of the species assigned to the genus, 14 in number, includes 2 from the equine, namely, *O. reticulata* and *O. cervicalis;* 6 from bovines, namely, *O. armillata, O. lienalis, O. gutturosa, O. gibsoni, O. indica,* and *O. bovis; O. flexuosa* from the antelope; *O. fasciata* from the camel; 2 from man, namely, *O. volvulus* and *O. caecutiens; O. fuelleborni* from *Neomeres phococoenoides;* and *O. bambusicolae* from *Bambusicola thoracica.*

Antigenic studies on the genus Pasteurella, G. C. BOND and C. M. DOWNS (*Kans. Acad. Sci. Trans., 38 (1935), pp. 87–92*).—In the studies reported no suitable method of classification based on cultural characteristics of members of the genus *Pasteurella* could be determined. "The weak antigenic properties of these organisms as previously reported was verified. Much cross-serological relationship was evident between the animal strains of *Pasteurella* used. No correlation between host origin and antigenic structure was apparent. No satisfactory method of grouping these organisms into subgroups could be devised. [Neither *P. tularense* nor *P. pestis* has any] serological relationship to other members of the genus. A definite serological relationship exists between *P. tularense* and *B[ruccila] abortus* which is not found with other members of *Pasteurella.*"

Hemolytic streptococci from tonsils of cow, hog, and sheep, I. PILOT, C. BUCK, and D. J. DAVIS (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 2, pp. 233–235*).—The authors have found that hemolytic streptococci frequently occur in the crypts of the tonsils of the cow (84 percent), hog (96 percent), and sheep (74 percent). They constitute part of the normal flora of the lymphoid tissue of the oropharynx of these animals. The streptococci conform to the animal type and differ from the human type and the *Streptococcus epidemicus* of bovine mastitis and epidemic septic sore throat.

Fibrinolytic activity of beta hemolytic streptococci from cow's milk, F. R. SMITH, C. L. HANKINSON, and C. S. MUDGE (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 2, pp. 266–270*).—The work reported has shown that (1) some beta hemolytic streptococci from milk are capable of causing the lysis of clotted bovine plasma, and (2) organisms from cows that are negative to nonspecific tests for mas'itis may produce this fibrinolysis.

The development of natural and artificial resistance of young rats to the pathogenic effects of the parasite Trypanosoma lewisii, C. A. HERRICK and S. X. CROSS (*Jour. Parasitol., 22 (1936), No. 2, pp. 126–129*).—This is a

contribution from the Wisconsin Experiment Station and the U. S. D. A. Bureau of Animal Industry cooperating.

The pathology of Crotalaria spectabilis Roth poisoning in cattle, D. A. SANDERS, A. L. SHEALY, and M. W. EMMEL (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 2, pp. 150–156*).—In a further study of *C. spectabilis* poisoning at the Florida Experiment Station (E. S. R., 72, p. 605), the "clinical symptoms, gross and microscopic lesions occurring in a herd of cattle under natural conditions were reproduced in animals experimentally by daily oral administration of pulverized *C. spectabilis* seed. *C. spectabilis* poisoning, as observed in cattle under natural conditions, assumed a chronic form with gradual onset unaccompanied by clinical manifestations in the beginning. Clinical symptoms in cattle grazing daily on crotalaria for 2 weeks developed after a latent period of from 2 to 6 mo. These consisted of impaired appetite, diarrhea, ascites, acute bloating, decubitus, and tenesmus, with partial eversion of the rectum.

"At autopsy there were observed hydroperitonia; a firm, resistant, indurated liver; enlarged gall bladder; icterus; congestion of the kidneys; congestion, edema, and emphysema of the lungs; edematous infiltration of the submucous layer of the abomasal folds and of the subserous coverings of the double elliptical coils of the colon; with hypertrophy of the cardiac muscle.

"Microscopically there was observed a diffuse inter- and intra-lobular fibrosis, atrophic degeneration, and pigmentation of the hepatic parenchyma; fibrosis of the spleen; parenchymatous degeneration and fragmentation of the renal epithelium; connective tissue proliferation, edema and emphysema of the pulmonary tissues; and parenchymatous degeneration and epithelial exfoliation of the mucous membrane of the intestinal tract."

Oak poisoning in range cattle and sheep, I. B. BOUGHTON and W. T. HARDY (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 2, pp. 157–162*).—Several outbreaks of highly fatal poisoning among range sheep and cattle observed by the Texas Experiment Station resulting from the eating of the buds, green shoots, and young leaves of the common shin oak (*Quercus breviloba*), which occurs in abundance on the ranges of the Edwards Plateau region of western Texas, are reported upon. Following a brief reference to the literature, investigations of the cause, course, symptoms, post-mortem lesions, and treatment and prevention are dealt with.

The disease ran a fairly acute course, a few animals having died within 24 hr. after manifesting symptoms, but with the majority the symptoms appeared from 5 to 10 days before succumbing. Some chronically affected animals lingered for more than a month. Complete recovery of either cattle or sheep seldom occurred under 2 or 3 weeks. The mortality of affected animals averaged about 85 percent in cattle and 90 to 95 percent in sheep.

No efficient means of treatment was found. Prevention of the condition should provide for the separation of the animal and the shin oak during the period when the buds and young leaves are apparently very toxic.

Inhibiting effect of sulphur in selenized soil on toxicity of wheat to rats, A. M. HURD-KARRER and M. H. KENNEDY (*Jour. Agr. Res. [U. S.], 52 (1936), No. 12, pp. 933–942, figs. 4*).—In experiments conducted, "wheat grown on soil containing 2 p. p. m. of selenium and comprising 70 percent of the diet of white rats produced the retarded growth and the liver injury characteristic of selenium poisoning. Wheat grown on similarly selenized soil treated with flowers of sulfur or with gypsum was not toxic. Chemical analysis of the grain showed that the sulfur and gypsum treatments reduced the concentration of selenium in the grain from about 12 p. p. m. to about 4 p. p. m."

Studies in Brucella infections (*Michigan Sta. Tech. Bul. 149 (1936), pp. 51*).—This consists of reports of five separate studies.

Non-specific agglutination in the Brucella group, I. F. Huddleson, J. W. Scales, and O. J. Sorenson (pp. 5–20).—The results obtained from the examination of a total of 410 strains of *B. abortus*, 240 strains of *B. suis*, and 140 strains of *B. melitensis*, by means of the thermoagglutination test of Burnet (E. S. R., 60, p. 870) over a 3-yr. period, show conclusively that the phenomenon is mutable in character and, once its occurrence has been demonstrated in a strain, it usually occurs again. Partially or completely dissociated strains of *Brucella* were found unreliable as antigens for the agglutination test. There are long intervals during which dissociated strains are heat stable. The thermoagglutination test serves only as an approximate means of detecting rough and dissociated variants of *Brucella*. It cannot be depended upon entirely as a routine test for the selection of normal cultures for use as antigens in the agglutination test. There is partial evidence that heat instability is due to changes in the chemical composition of the cell and to a rearrangement of certain chemical constituents.

"It has been noted that agar agglutination and thermoagglutination of *Brucella* cells are two entirely separate and distinct phenomena. The heating of a suspension of *Brucella* cells, to which dissolved agar has been added, to a high temperature in order to obtain agglutination of the cells is not necessary except when the agar is present in a high dilution. The presence of dissolved agar in a high dilution in *Brucella* antigens does not materially affect its specific agglutinating property."

A list of 22 references to the literature is included.

The chemical examination of an avirulent strain of Brucella abortus, A. D. Hershey and I. F. Huddleson (pp. 21–23).—In this contribution the occurrence and properties of various cellular fractions of an avirulent strain of *B. abortus* are described, and comparisons with the composition of normal strains are made. The principal differences were found to consist in serological dissimilarities between the protein fractions and in the absence in the nonpathogenic strain of a conjugated protein constituent which is largely responsible for the toxicity and serological properties of the virulent strain.

A study of Brucella abortus-infected tissues as immunizing agents against Brucella infection in the guinea pig, J. W. Scales and I. F. Huddleson (pp. 24–27).—In a study aimed at the determination of the value of *B. abortus* infected tissue as an immunizing agent against *Brucella* infection in the guinea pig, the spleens of infected guinea pigs and infective fetal exudate from fetal membranes treated to render them noninfective were studied. "The results show conclusively that when infected guinea pig spleen and exudate from the fetal membranes of an aborted bovine fetus are treated with either chloroform or formalin to render them noninfective, they are without value as immunizing agents against experimental *B. abortus* infection in the guinea pig."

A method for measuring the opsonocytophagic power of the blood of cattle for Brucella, I. F. Huddleson, H. W. Johnson, and D. B. Meyer (pp. 28–34).—A method for determining the degree of immunity in cattle against *Brucella* infection is described. It involves the measuring of the phagocytic power of the polymorphonuclear leucocytes in an opsonocytophagic system.

Undulant fever: A report of 100 cases treated with brucellin, I. F. Huddleson, H. W. Johnson, and C. P. Beattie (pp. 35–51).—Following the preliminary report on the value of brucellin therapy in undulant fever (E. S. R., 70, p. 529), a more extensive study was made of the product on a wide variety and type of

cases, mainly to learn more about its therapeutic value, and is here reported upon. Summarized data are presented which show the value of brucellin in the treatment of 100 cases of undulant fever. Of the total number of cases dealt with, 23 were children under 11 yr. of age.

"Of the 70 cases in which the duration of symptoms was less than 121 days before treatment with brucellin, 51 (73 percent) recovered within 22 days after the first injection, 18 (26.1 percent) after the 22-day period, and 1 (1.4 percent) failed to respond to treatment. Of the 30 cases in which the duration of symptoms was more than 120 days before treatment, 17 (56.6 percent) recovered within 22 days after the first injection, 10 (33.3 percent) recovered after the 22-day period, 2 terminated fatally, and 1 failed to respond to treatment. If one excludes the 6 cases that failed to respond to treatment and the 2 that succumbed, it will be found that the average duration of illness per case before treatment was 159.3 days. The average duration of illness per case after treatment was begun was 18.3 days.

"The serum agglutination titer was either negative or less than 1–50 in 33 cases. Of the 33 cases, 22 (66 6 percent) were children under 11 yr. of age. Positive blood cultures were obtained in only 16 of the 85 cases cultured. Of the 16, 7 were *B. abortus*, 5 were *B. suis*, and 4 were *B. melitensis*. An allergic test made intradermally with a standardized allergin and a proved opsonocytophagic test carefully conducted are indispensable for the accurate diagnosis of a large percentage of cases of brucelliasis. The latter test may also be used in determining recovery from the disease."

Reaction-frequency in Denmark and Finland for abortus-infection in cattle, A. THOMSEN and V. RISLAKKI (*Skand. Vet. Tidskr., 26 (1936), No. 5, pp. 321–328: Eng. abs., pp. 327, 328*).—Agglutination tests for *Brucella abortus* infection resulted in a reaction percentage of from 21.5 to 35.4 for more than 1,000 blood samples made in Denmark and 3.5 to 14.3 for a similar number made in Finland.

The effect of Brucella abortus infection of the udder on the quality of milk, C. S. BRYAN and D. B. MEYER (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 2, pp. 199–206*).—In work at the Michigan Experiment Station the quality of milk secreted by *B. abortus*-infected udders is decreased as compared with that from healthy udders, but the changes are not so pronounced as those found in streptococcic mastitis. *B. abortus* may cause a low-grade mastitis, as has been indicated in previous histopathological studies by Sholl and Torrey (E. S. R., 65, p. 70) and by the results of the tests employed in this study. The chemical composition of milk may be altered as a result of *B. abortus* infection of the udder.

Experimental vaccination of range calves with a living culture of Brucella abortus.—I, Results of agglutination tests made at intervals during three years following vaccination, W. J. BUTLER, D. M. WARREN, and H. MARSH (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 2, pp. 163–168, fig. 1*).—Contributing from the Montana Experiment Station the authors record the results of post-vaccination tests for *B. abortus* agglutinins in the blood serum of range heifers vaccinated with a living culture of *B. abortus* of low virulence. "These tests show that in a group of heifers vaccinated at 6 to 12 mo. of age, the agglutinins produced by vaccination were reduced in 12 mo. to the extent that no reactions occurred at a 1:200 dilution, and that at the end of 2 yr., 77 percent of the heifers were negative at 1:25 and none reacted at a dilution higher than 1:50.

"In a group of heifers in the same herd which were vaccinated at the age of 4 to 6 mo., there were no reactions at 1:200 in 8 mo., and at the end of

2 yr., 97 percent of the heifers were negative at 1:25 with no reactions higher than 1:50.

"The results of these agglutination tests also indicate that *B. abortus* did not become established in any of the heifers as a result of vaccination."

Observations pertaining to standards of interpretation of agglutination titres in the diagnosis of Bang's disease, C. R. DONHAM and C. P. FITCH (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 2, pp. 176–186*).—Data are given in this contribution from the Minnesota Experiment Station which indicate "the effect, from a percentage standpoint, of different standards for interpretation of agglutination results. Data are presented which disprove the idea that all agglutinating substances demonstrated in low dilutions should be considered as evidence of active infection with *Brucella abortus*. The inadequacy of inflexible standards for interpretation of agglutination results is emphasized by these data. The policy of making diagnoses of suspicious cases in Bang's disease only after careful consideration of the complete status of the entire herd is advocated."

Bang's-disease control, M. JACOB (*Tennessee Sta. Rpt. 1934, pp. 13, 14*).—The progress of control work during the year in the breeding herds at both the Middle and West Tennessee Substations is briefly referred to (E. S. R., 73, p. 236).

Bovine mastitis, W. T. MILLER (*North Amer. Vet., 17 (1936), No. 3, pp. 32–41*).—A practical summary of information presented with a list of 18 references to the literature.

Infectious bovine mastitis.—IV, The curd tension of normal and mastitis milk, E. O. ANDERSON, C. L. HANKINSON, W. N. PLASTRIDGE, and F. J. WEIRETHER ([*Connecticut*] *Storrs Sta. Bul. 211 (1936), pp. 15*).—In further work with infectious bovine mastitis (E. S. R., 73, p. 104) the three principal organisms associated with chronic mastitis—group A and group B streptococci and staphylococci—were found equally effective in reducing the curd tension of milk. "Coli-like mastitis infections decrease the curd tension to a greater extent than any of the other reported types of mastitis infections. With a leucocyte content of a million the curd tension was definitely lowered. Each additional million leucocyte count was accompanied by a further decline in curd tension. In fact this correlation was observable even when the organisms of mastitis were not found. About 65 percent of the disease-free quarters of Holsteins and Ayrshires yielded milk of low curd tension. The number of mastitis-free Guernseys and Jerseys producing natural low curd tension milk seems to be negligible.

"In mastitis-free milk a correlation coefficient of $\pm 0.9707 + 0.0138$ P. E. [probable error] was found between casein content and curd tension, while for milk from diseased udders the correlation coefficient was $+0.8125 \pm 0.810$ P. E. High casein content is associated with high curd tension. Multiple correlations between curd tension and CaO and P_2O_5 in mastitis-free milk was $+0.9120 \pm 0.0328$ P. E., while for milk from diseased udders it was $+0.6212 \pm 0.1566$ P. E."

Rennet test for the detection of mastitis, F. B. HADLEY (*Jour. Dairy Sci., 19 (1936), No. 3, pp. 165–169*).—This contribution from the Wisconsin Experiment Station describes a new milk test with fresh commercial fluid rennet for the detection of mastitis. It is believed that this method of testing, because of its simplicity and cheapness, may have practical use. Comparisons of the results secured by the rennet method with those secured by other methods are presented.

Severe ascariasis in calves, N. S. SEVILLA (*Philippine Jour. Anim. Indus., 3 (1936), No. 2, pp. 137, 138*).—A report is made of the loss of 2- to 4-week-old calves on a ranch in Zambales due to an infestation by *Ascaris vitulorum*.

Experiments on anthrax vaccination [trans. title], G. RAMON and A. STAUB (*Compt. Rend. Soc. Biol. [Paris], 119 (1935), No. 25, pp. 1073–1076; abs. in Vet. Rec., 16 (1936), No. 16, pp. 504, 505*).—The authors conclude that it is possible to confer on sheep a solid and durable immunity against anthrax by a single dose of Pasteur's first vaccine, incorporated in lanolin.

Experimental treatment of caseous lymphadenitis of the sheep and goat in the French Sudan [trans. title], MISSENARD (*Bul. Acad. Vét. France, 8 (1935), No. 6, pp. 314–319*).—The intradermal administration of a bacterin composed of cocci and staphylococci has been found the most effective and practical means of protection against caseous lymphadenitis, a coccal disease of sheep and goats of common occurrence in the French Sudan.

Prevention of death losses in sheep on areas infested with pingue (Actinea richardsoni), K. W. PARKER (*New Mexico Sta. Bul. 241 (1936), pp. 53, figs. 19*).—Experimental work with *A. richardsoni*, commonly known as pingue or the Colorado rubber plant, the cause of heavy death losses of range sheep, particularly in the northeastern portion of New Mexico, is reported, the details being given in tables and charts.

It has been found that death losses in sheep from this plant "can be reduced, if not entirely avoided, by managing the sheep in such manner that they enter pingue areas in at least fairly good physical condition after lambing; that is, it is important that they have a reserve of the necessary elements and nutrients in their bodies in order to obviate any depraved appetite that they might otherwise have when placed on pingue-infested areas. Sheep should be closely culled before entry on pingue range, so that all broken-mouthed ewes may be removed from the band. Animals exhibiting symptoms of pingue poisoning should be removed from the flock and placed on range that is not infested with this poisonous plant.

"Chemical analyses of the principal forage grasses from the pingue experimental range indicated that these approached a deficiency in calcium and phosphorus. The feeding of a mineral supplement containing calcium and phosphorus was evidently beneficial, since the weights of ewes and lambs so fed were increased over those fed salt alone.

"The bedding out system of grazing sheep, whereby a new bed ground is established every night or every 2 or 3 days in choice areas of forage, should be closely adhered to when grazing sheep on pingue-infested ranges. Sheep should not be placed on pingue range before the range is ready for grazing, as determined by close observation of the stage of growth of certain plants that indicate the proper time for grazing to begin. Loss of sheep from poisoning and injury to the range by premature grazing are both thus avoided. Death losses in sheep from pingue poisoning may occur at any time during the year, but the most dangerous times for grazing areas infested with this plant are in spring and late fall, when palatable forage is likely to be scarce.

"It is evident from observation that pingue invades most rapidly ranges which have been more or less opened up by overgrazing. Results from vegetative plats indicated that pingue can be eradicated by pulling or digging the plants, that this plant increases in area during overgrazing, and that the spread of pingue can be checked by giving the area complete protection from livestock grazing. A 25-percent aqueous solution of Atalacide applied in the form of a spray secured a 95.3-percent kill of pingue plants. However, except on small areas, the expense would be too great to make eradication of this plant by either mechanical or chemical means practical under range conditions."

A palatability and check list of the flora of Mount Taylor, Valencia County, N. Mex., is appended.

The occurrence of Syngamus in the nasal fossae of sheep in Brazil [trans. title], Z. VAZ (*Arch. Inst. Biol. [São Paulo], 6 (1935), pp. 35–39, figs. 8; Eng. abs., pp. 38, 39*).—The occurrence of *Syngamus* in the nasal cavities of sheep in São Paulo is recorded. The author failed to find *S. nasicola* to differ specifically from *S. laryngeus* of cattle. The great variations presented by *S. laryngeus* appear to be accentuated by the different locations in the host.

Mass feeding of sheep with copper sulphate and salt to control gastro-intestinal parasites, J. H. RIETZ (*West Virginia Sta. Bul. 271 (1936), pp. 11*).—Experiments with sheep here reported indicate that "the mixture of copper sulfate and salt, 1:30, when fed to sheep ad libitum and consumed at the rate of 0.5 lb. per sheep per month, did not adequately control the development of nematode parasites in the gastrointestinal tract, yet caused the death of sheep from poisoning. A mixture of copper sulfate and salt, 1:50, was wholly inadequate in controlling nematode parasites in the gastrointestinal tracts of these sheep. The 1.5-percent solution of copper sulfate and the mixture of equal parts of a 1.5-percent solution of copper sulfate and a 1.5-percent solution of nicotine sulfate were equally efficient in the control of nematode infestation. Cestode infestation also disappeared equally under the two treatments."

Infectious pleuropneumonia of goats: Experimental behavior of a virus isolated from the central nervous system, J. TRAVASSOS (*Compt. Rend. Soc. Biol. [Paris], 121 (1936), No. 11, pp. 1121, 1122*).—The author reports having isolated a filtrable virus from the brain and spinal cord of enzootic cases among native and imported goats, which proved to be pathogenic for the guinea pig and rabbit, as well as the goat, among the animals thus far inoculated. The autopsy of infected goats revealed pulmonary lesions, representing several forms of pneumonia.

Anomalous urinary system in a small pig, J. F. BULLARD (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 2, pp. 220, 221, fig. 1*).—Contributing from the Indiana Experiment Station a description is given of an anomalous urinary system found in a small 8-week-old Chester White male pig which weighed approximately 20 lb.

Immunization experiments with swine influenza virus, R. E. SHOPE (*Jour. Expt. Med., 64 (1936), No. 1, pp. 47–61*).—The author reports upon further experiments (E. S. R., 74, p. 394) conducted in an effort to determine the effect of dosage, route of administration, and animal source upon the efficacy of swine influenza virus in immunizing swine, ferrets, and mice. The swine influenza virus obtained from the lungs of infected ferrets or mice, when administered intramuscularly or subcutaneously, was found to immunize the swine to swine influenza. "Ferrets which have received subcutaneous injections of swine influenza virus obtained from the lungs of infected ferrets are immune to intranasal infection with this virus. Similar injections with virus from the lungs of infected mice or swine do not immunize. Mice can be immunized to intranasal infection with swine influenza virus by the subcutaneous injection of virus obtained from the lungs of infected mice, but not by similar injection with virus from the lungs of infected ferrets or swine. Repeated injections induce greater immunity than a single one. Intraperitoneal inoculation of both mice and ferrets with swine influenza immunizes them to intranasal infection, and it appears to make little or no difference whether the virus used as vaccine is obtained from the lungs of infected mice, ferrets, or swine. Field experiments in which swine influenza followed the intramuscular administration of virus are cited as examples of the hazard involved in the use of this means of immunization in a densely crowded susceptible population."

Notes on the preparation and use of an antigen for the agglutination test in swine erysipelas, A. W. DEEM (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 2, pp. 197, 198*).—Beef infusion broth containing yeast and tryptophan was found to provide an excellent medium for the growth of *Erysipelothrix rhusiopathiae* as the antigen in the agglutination test in swine erysipelas. A method is described for the preparation of an antigen that stays in suspension so that the test may be read after incubation for 24 hr.

Adaptation of Stichorchis giganteus, a parasite of peccaries (Dicotyles spp.), to the domestic pig: A redescription [trans. title], Z. VAZ (*Arch. Inst. Biol. [São Paulo], 6 (1935), pp. 45–52, figs. 7; Eng. abs., p. 51*).—The occurrence of *S. giganteus* Diesing 1835 in the domestic pig in São Paulo, Brazil, is reported and a redescription given based upon material from this host.

Transmission of the virus of equine encephalomyelitis through Aedes albopictus Skuze, J. S. SIMMONS, F. H. K. REYNOLDS, and V. H. CORNELL (*Amer. Jour. Trop. Med., 16 (1936), No. 3, pp. 289–302*).—The experiments here reported have shown that the virus of equine encephalomyelitis, western type, can be transmitted biologically from infected to normal animals through *A. albopictus*, a common, semidomestic, oriental mosquito.

Further studies on transmission of equine encephalomyelitis by mosquitoes, D. E. MADSEN, G. F. KNOWLTON, and J. A. ROWE (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 2, pp. 187–196*).—In further experimental work by the Utah Experiment Station (E. S. R., 73, pp. 108, 393; 74, p. 235), "the period of transmissibility of equine encephalomyelitis virus in *Aedes nigromaculis* varied between 4 and 10 days, with the peak at 6, 7, and 8 days. In *A. dorsalis* the period varied between 9 and 19 days, with 12, 13, and 14 days as the most likely choice of a peak. The period of virus availability in the donor for *A. nigromaculis* was between 18 and 66 hr., inclusive. In *A. dorsalis* the period was from 18 to 42 hr., inclusive. A limited number of attempts to transmit the disease to horses by means of these two native mosquitoes were unsuccessful."

The seat of the virus of Argentine equine encephalomyelitis (experimental disease) [trans. title], R. REMLINGER and J. BAILLY (*Compt. Rend. Soc. Biol. [Paris], 121 (1936), No. 5, pp. 429–431*).—Inoculation experiments with emulsions of tissues from infected animals have shown the Argentine virus of equine encephalomyelitis to occur in the parotid and adrenal glands but not in the urine of the infected horse, rabbit, or guinea pig. It may be present in the blood.

Inoculability of the Argentine virus of equine encephalomyelitis by the external auditory canal [trans. title], B. REMLINGER and J. BAILLY (*Compt. Rend. Soc. Biol. [Paris], 121 (1936), No. 10, pp. 933, 934*).—Two transmission experiments with the rabbit and guinea pig here reported have shown the virus of Argentine equine encephalomyelitis to be transmissible by way of the external auditory canal, as has previously been shown by Levaditi and Vieuchange (see p. 840) to be the case with herpes-encephalitis, and by the authors with Aujeszky's disease (see p. 840).

Pure cultivation of filtrable virus isolated from canine distemper.—II, Morphological and cultural features of Asterococcus canis, type I, n. sp. and Asterococcus canis, type II, n. sp., H. M. SHOETENSACK (*Kitasato Arch. Expt. Med. [Tokyo], 13 (1936), No. 2, pp. 175–183, pls. 2*).—In continuation of the study previously noted (E. S. R., 72, p. 536), a description is given of the micro-organism isolated under the name *A. canis* n. sp, of which there are two types. Type 1 is considered to be the true cause of the contagious respira-

tory type of canine distemper; type 2 appears to play a secondary part in the etiology of the disease.

A case of suppurative epididymitis in a dog caused by Brucella abortus, T. L. WHITBY, T. J. BOSWORTH, and J. R. M. INNES (*Vet. Rec., 48 (1936), No. 21, pp. 662, 663, 664*).—A case report of infection in the dog.

Infectious rhinitis (coryza) (*Rhode Island Sta. Rpt. [1935], p. 32*).—Reference is made to the progress of work during the year with *Hemophilus gallinarum* as related to infectious coryza of poultry (E. S. R., 73, p. 689).

Massachusetts poultrymen successful in maintaining pullorum disease-free flocks, H. VAN ROEKEL (*New England Poultryman and Northeast. Breeder, 22 (1936), No. 3, p. 37*).—This contribution from the Massachusetts Experiment Station refers briefly to the progress of pullorum disease eradication work in Massachusetts (E. S. R., 74, p. 400).

Tuberculosis of poultry, A. J. DURANT (*Missouri Sta. Bul. 364 (1936), pp. 22, figs. 10*).—A practical summary of information of this disease of poultry and its control and eradication.

Naphthalene poisoning in poultry, C. B. HUDSON (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 2, p. 219*).—A report on the loss of poultry from the ingestion of naphthalene moth balls placed in the nests for protection from lice and mites is contributed from the New Jersey Experiment Stations. "The symptoms observed in the birds presented were identical. Their combs were red and their eyes bright. There was a partial paralysis of the legs. The feathers around the vent were soiled with greenish black fecal material. On autopsy the hen [presented for examination] showed the following changes: There were small blisterlike areas in the mucosa of the crop. The liver was swollen and showed small necrotic areas. The intestines were catarrhal, and the gizzard contents gave off a strong odor of naphthalene."

The avian spirochetoses [trans. title], J. VERGE (*Rec. Méd. Vét., 112 (1936), No. 5, pp. 257–270*).—A summary of information on spirochetosis of the fowl due to *Spirochaeta gallinarum* and of the goose due to *S anserina*, with a brief reference to other avian spirochetoses.

Blackhead (infectious enterohepatitis) in turkeys, with notes on other intestinal protozoa, H. M. DEVOLT and C. R. DAVIS (*Maryland Sta. Bul. 392 (1936), pp. 493–567, figs. 15*).—The studies reported have shown that blackhead is not regularly, if ever, transmitted through the egg. It has been controlled consistently by incubator hatching and rearing poults in isolation from adult turkeys or chickens or soil contaminated by such birds. The parasite (*Histomonas meleagridis* Tyzzer) has been found to be present in the breeder yard as shown by the appearance of the disease in poults hatched by the turkey hen. The mortality rate in such young birds has varied between 33 and 76 percent of the hatch. The most frequent time of death in these poults has been during the second month of their life, but deaths from blackhead have occurred at earlier and later dates during the growing period as well. Blackhead has also appeared in the grown turkeys, most commonly causing the death of young hens in heavy egg production. The causative parasites have also been found in the chicken yard, as young turkeys have readily contracted the disease when reared under those conditions.

"The presence of blackhead parasites has been demonstrated in contaminated soil, as shown by the appearance of the disease in young turkeys placed in experimental pens on top soil taken from the turkey breeder or chicken yards. Such experiments have furthermore indicated that deaths may occur in from 2 to 3 weeks after young turkeys are exposed in this way to the disease. Experiments

conducted on the problem of fly transmission have indicated that flies may be regarded with suspicion as carriers of blackhead.

"The transmission of blackhead by inoculations with material taken from the affected internal organs has made possible the isolation and identification of the causative parasite. Tyzzer's 'inoculated' blackhead [E. S. R., 43, p. 885] has been reproduced by placing small pieces of affected liver tissue beneath the skin, and a new form of blackhead has resulted from the implantation of such material in cavities of the head.

"The isolation of the blackhead parasite in protozoan pure culture on modified Locke's egg medium has been accomplished by feeding young turkeys with affected liver tissue and seeding the culture medium with the cecal droppings or contents obtained at autopsy. The observation of this parasite in such droppings and cultures has shown it to be identical with *H. meleagridis* Tyzzer. The feeding of the cultures to young turkeys has regularly produced blackhead. Trichomonads which were formerly held to be the causative agent of blackhead by some investigators have been found on some occasions to be present in blackhead livers. While inoculation studies with trichomonads have given rise to the belief that they may be capable of causing disease under certain conditions, it was not possible to produce blackhead lesions regularly with them.

"The parasitological and clinical periods that prevail during the course of an attack of blackhead in young poults have been studied by making inoculations with Locke's egg medium cultures of histomonads. Under the conditions of this experiment, death occurred at various times between the ninth and fifteenth day after inoculation. Symptoms of illness appeared in from 4 to 9 days after inoculation, and in all cases the affected poult voided the causative parasites in the droppings before showing symptoms of illness. It was possible to transmit the disease by feeding normal poults with fresh cecal droppings containing the histomonads"

An anatomopathological study of enterohepatitis or blackhead of turkeys [trans. title], J. R. MEYER (*Arch. Inst. Biol. [São Paulo], 6 (1935), pp. 85–94, pls. 6; Eng. abs., p. 93*).—A report is made of a study of 15 spontaneous cases of blackhead in turkeys, presented with a list of 15 references to the literature.

Salmonellosis of webfooted fowl [trans. title], LESBOUYRIES and BERTHELON (*Rec. Méd. Vét., 112 (1936), No. 4, pp. 193–209*).—Following a general discussion of paratyphoid organisms and their differentiation by biochemical and serological means, an account is given of the *Salmonalla* infections of palmipeds. Salmonellosis is a disease of adult as well as young ducks and geese.

Staphylococcus infections in birds [trans. title], J. REIS and P. NOBREGA (*Arch. Inst. Biol. [São Paulo], 6 (1935), pp. 63–68, pls. 2; Eng. abs., pp. 66, 67*).—The authors' observations are presented with a review of the literature on *Staphylococcus* infection in birds, a list of 14 references to which is included.

"In São Paulo in 2,088 autopsies made in the Biological Institute we observed 6 cases of staphylococcic arthritis, 3 being in hens (in 1 case the sample was also isolated from the liver), 2 in pigeons, and 1 in a canary. The 2 pigeons were from the same loft, where the disease manifested itself simultaneously in many individuals. From a pigeon of the same origin, which died suddenly with arthritis, nonhemolytic *S. aureus* was isolated from the liver. One of the hens with arthritis presented antitoxin in the serum capable of neutralizing the toxicity of the sample for the mouse.

"In 1 hen we observed a staphylococcic abscess . . . in the superciliary region, which regressed spontaneously. In 1 case of acute spontaneous conjunctivitis, also in a hen, we isolated hemolytic *S. aureus* in abundant culture.

but by instillation of the culture we were not able to reproduce the disease in a healthy bird.

"In the skin of pigeons with the reaction of vaccination against chicken pox we frequently observed the presence of hemolytic staphylococci, which are not found normally."

The text includes a chart in which the characters of the staphylococci isolated, both from normal birds and those with pathologic manifestations, are given.

Parasitism and tuberculosis in a crow, F. R. BEAUDETTE and C. B. HUDSON (*Jour. Amer. Vet. Med. Assoc., 89 (1936), No. 2, pp. 215–217*).—Post-mortem examination by the New Jersey Experiment Stations of two crows that had been shot on a farm near Stockton, Hunterdon County, N. J., showed the presence of the gizzard worm *Acuaria anthuris*, a common parasite of crows in that section, and of tapeworms in each bird. The examination of blood smears revealed the presence of many microfilariae, thought to be *Diplotriaena tricuspis*, in one of the specimens and in a crow collected later which appeared to be suffering from an injured wing and was kept in the laboratory until it died from tuberculosis.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Indiana Station] (*Indiana Sta. Rpt. 1935, pp. 7–13, figs. 5*).—The progress results are briefly presented of investigations on mechanical control of the corn borer, cornstalk covering equipment, low-pressure pneumatic tires for tractors, combines, and manure spreaders, artificial heat and humidity in poultry housing, field ensilage harvesting equipment, a temporary crib silo, erosion control, hay and grain drying, electric brooding of chicks, precooling of fresh fruits in refrigerator cars, codling moth control with electric insect traps, heating apple-washing solution, soil heating with electricity, and sweetpotato storage.

Surface water supply of the United States, 1934, Parts 1–3, 12A (*U. S. Geol. Survey, Water-Supply Papers 756 (1936), pp. X+383, fig. 1; 757 (1936), pp. VII+216, fig. 1; 758 (1936), pp. X+387, fig. 1; 767 (1936), pp. VI+172, fig. 1*).—These papers present the results of measurements of flow made on streams during the year ended September 30, 1934, No. 756 covering the North Atlantic slope basins, No. 757 the South Atlantic slope and eastern Gulf of Mexico basins, No. 758 the Ohio River Basin, and No. 767 the North Pacific slope basins—Pacific slope basins in Washington and upper Columbia River Basin.

Ground water in south-central Tennessee, C. V. THEIS (*U. S. Geol. Survey, Water-Supply Paper 677 (1936), pp. V+182, pls. 7, figs. 2*).—This report, prepared in cooperation with the Tennessee Division of Geology, describes the ground water resources of an area covering 12 counties in south-central Tennessee.

Potability of water from the standpoint of fluorine content, H. V. SMITH (*Amer. Jour. Pub. Health, 25 (1935), No. 4, pp. 434–441*).—In continuation of the fluorine studies at the Arizona Experiment Station, this investigation made a comparison of the Fairchild, Foster, Willard and Winters, and Sanchis methods for determining fluorine in water. The Fairchild method gave values consistently higher than the other three methods, and the Foster method was not satisfactory when aluminum sulfate had been used to remove fluorine from water. Removal of fluorine from water was found to be impractical by the freezing method, prohibitive in cost by the aluminum sulfate method, and prohibitive in cost by the use of activated carbon after a reduced pH of below

3.0. A concentration of from 0.8 to 0.9 p. p. m. of fluorine in water was found to cause mottled teeth in children during susceptible age. A discussion by J. M. Sanchis is included.

Pump irrigation at the North Platte Experimental Substation, H. E. WEAKLY (*Nebraska Sta. Bul. 301 (1936), pp. 12, figs. 2*).—This bulletin reports the results of work dealing with pump irrigation in the production of crops under conditions approximating general farm practices at the North Platte Experimental Substation. The results from the earlier years of this work have been published previously (E. S. R., 59, p. 678; 68, p. 100).

Cost data for 11 seasons of irrigation pumping are summarized.

Practical aspects of flood control and reclamation of overflowed lands, A. G. CLASSEN (*Tex. State Reclam. Dept. Bul. 27 (1935), pp. VIII+80, figs. 38*).—This is a brief discussion of flood control and reclamation as a source of pertinent information for those interested in the development of flood control and prevention projects on the smaller rivers and streams. The principal part of the discussion treats with the proper design of floodways, channels, and interior drainage of levee improvement districts, and attempts to point out the chief reasons for errors and mistakes most common to this type of public improvement and methods of avoiding them.

Chapters are included on rainfall, run-off, and stream discharge; general plans and methods of flood control; surveys and investigations; the hydraulics and design of floodways and channel improvements; design and construction of levees; and interior drainage, sluice gates, and pumping plants.

A bibliography is included, the contents of which are recommended as reliable references on the subject.

Research in Iowa in soil erosion, soil conservation, and related land use planning, R. E. BUCHANAN (*Iowa Sta., 1936, pp. [2]+47*).—This mimeographed publication outlines the manner of organization and coordination of the research program in soil erosion control, soil conservation, and related land-use planning in Iowa, enumerates the research projects being actively pursued in these subjects, and presents a program of additional research, by projects, considered essential to the success of soil conservation and land-use practices in the State.

Soil erosion in Iowa, R. H. WALKER and P. E. BROWN (*Iowa Sta. Spec. Rpt. 2 (1936), pp. 47, figs. 28, map 1*).—The results of a reconnaissance erosion survey of Iowa is reported, which was conducted in cooperation with the U. S. D. A. Soil Conservation Service. The observations related to factors influencing soil erosion, the extent and seriousness of erosion in the various parts of the State, and control measures which have been found to combat soil erosion successfully.

The survey revealed (1) that only about 13 percent of the total land area of Iowa shows little or no evidence of erosion; (2) that approximately a third of the land shows slight sheet erosion, and up to 25 percent of the original surface soil has been washed away; (3) that more than 14 percent of the land has lost from 25 to 50 percent of its surface soil by erosion, and that most of this area shows occasional to moderate gullying; (4) that about 31 percent of the land has been seriously eroded and from 50 to 75 percent of the original fertile surface soil has been washed away, and that this land has also been moderately to excessively gullied; and (5) that about 9 percent of the land has been severely eroded and has had 75 percent or more of the original surface soil washed away by erosion, and that there has also been moderate to excessive gullying in this area.

Approximately 30 billion tons of soil are estimated to have been washed away from Iowa land since its cultivation was begun by man. This is equivalent to

a loss of more than 137,000 tons of soil per 160-acre farm, or approximately 35 percent of the original surface soil.

Along with the loss of surface soil there has been a tremendous loss of plant nutrients amounting to about 247 tons of nitrogen, 82 tons of phosphorus, and 2,046 tons of potassium for every 160 acres. On the basis of the present price of commercial fertilizers containing these plant nutrients, this loss would amount to approximately $2,975 per acre of farm land. The capital value of Iowa farms is thus being depleted by erosion—a depletion that is actually far greater in value than the land's market price.

Erosion is in the incipient stage on much Iowa land, and the evidences of it are not readily recognized.

Cropping systems in relation to erosion control, M. F. MILLER (*Missouri Sta. Bul. 366 (1936), pp. 36, figs. 18*).—This report has been prepared in cooperation with the U. S. D. A. Soil Conservation Service. It is based on a State-wide survey of the erosion conditions in Missouri, which revealed soil losses much more serious than have generally been recognized. According to this survey one-half of the total area of the State has lost at least one-half of the surface soil and this has taken place in about three generations.

It was found that erosion from cultivated uncropped land totals approximately twice that from land in continuous corn. However, erosion from continuous wheat is only about half, and that from a good rotation is less than 20 percent, of that from continuous corn. The erosion from continuous sod is almost negligible. In general these results are taken to indicate that under ordinary conditions cropping and cultural systems may be so adjusted as largely to control erosion losses.

It is concluded that the standard rotations consisting of 1 or 2 yr. of corn, 1 or 2 yr. of small grain, and 1 or 2 yr. of clover or clover and grass, represent some of the most effective cropping systems known for controlling erosion. The various combinations of small grain crops and Korean lespedeza offer a great deal in the control of soil erosion under Missouri conditions.

When soybeans are sown in rows on rolling land this crop may cause so much erosion as to result in very serious soil losses. In such case the crop should be sown with a grain drill and if possible on the contour. The use of winter cover crops such as barley, rye, or wheat, lespedeza, vetch, and various clovers, is recommended wherever possible in order to lessen erosion losses during the fall, winter, and spring months.

The planting of row and drilled crops on the contour instead of merely with the fence lines offers a great deal for controlling erosion in the case of all soils of rolling topography.

A system of cropping known as strip cropping, which has recently been introduced into Missouri, provides that the crops in a rotation be planted in rather narrow strips, from 50 to 100 ft. wide, across the slope. This is very effective in controlling erosion.

Soil erosion control a basic reconstruction problem (*Puerto Rico Sta. Rpt. 1935, pp. 12, 13, figs. 2*).—This progress report points out that soil erosion has become a very important factor in the agriculture of the island. The heavy compact nature of the soils has resulted in much sheet erosion as well as gullying. The general conclusion is drawn that accelerated erosion of the agricultural land of the island is being brought about largely by using these lands for purposes or in ways to which they are not naturally adapted.

Rainfall, soil erosion, and run-off in South Africa, W. R. THOMPSON (*Univ. Pretoria, ser. 1, No. 29 (1935), pp. 31, figs. 4*).—This report briefly reviews the literature on erosion and run-off control and presents the results of an experiment which has been in operation for 4 yr. The object is to test the

amount of water lost through run-off and the amount of soil eroded from 10 differently treated plats. The selected slope is 3.75 ft. in 100 ft. Each plat is 6 ft. wide and 90 ft. long.

During the course of the experiment the loss of water and soil, respectively, was from 80 to 683 times greater from the uncultivated bare plat as compared with that from the veld intact plat. Avoidance of bare space is therefore fundamental to erosion control. Soil erosion and run-off are concomitant with the growing of cultivated crops. Maize and cowpeas grown for grain bear this out on a 3.75-percent slope. The cultivation of annual hay crops appears to be less detrimental. Teff grass prevents excessive erosion but permits run-off, especially at planting time and during the establishment period. The shallow root system of this crop and the short period it occupies the soil seem to account for the comparatively high run-off. Rhodes grass, representing perennial planted grasses, was most effective in preventing run-off and soil erosion. The establishment of planted grasses on lands subject to erosion is strongly advocated. Burning of surplus material (veld) annually increased bare space and encouraged run-off and soil erosion. The run-off was 27 times greater than that of a veld plat intact during a good rainfall season, 1933–34. This was the most undesirable veld treatment from this aspect.

Although close summer rotative grazing of veld with sheep increased run-off over and above veld left intact, it was less harmful than grazing and burning. It would appear that sympathetic grazing of veld will not increase run-off and soil erosion to a material extent. Overgrazing on the contrary will be decidedly harmful. Unused veld prevented run-off and soil erosion almost entirely on this slope. In two out of four seasons no run-off was recorded, while during the remaining two it was negligible. Fallowing appears to be unsuccessful in preventing run-off and erosion. Kraal manure when applied to maize effected a considerable decrease in run-off. The importance and effect of organic matter in run-off control is indicated. This is now being investigated more fully.

Public Roads, [July 1936] (*U. S. Dept. Agr., Public Roads, 17 (1936), No. 5, pp. [2]+89–112+[2], figs. 16*).—This number of this periodical contains data on the status of the various highway projects receiving Federal funds as of June 30, 1936, and the following articles: A Study of Road Tars, by R. H. Lewis and J. Y. Welborn (pp. 89–109); and Preserve Bench Marks for Future Use, by H. S. Rappleye (p. 110).

A. S. T. M. standards, 1933.—I, Metals. II, Non-metallic materials (*Philadelphia: Amer. Soc. Testing Materials, 1933, pts. 1, pp. XX+1002, pls. 2, figs. 122; 2, pp. XXVII+1298, pls. [6], figs. 203*).—Part 1 contains 185 standards, 104 of which relate specifically to ferrous metals and 70 to nonferrous metals. Part 2 contains 283 standards, of which 60 are standards covering cement, lime, gypsum, concrete, and clay products, 219 relate to miscellaneous materials, such as coal, timber, paints, petroleum, etc., and 4 apply in general to these materials.

1934 and 1935 Supplements to book of A. S. T. M. standards (*Philadelphia: Amer. Soc. Testing Materials, 1934, pp. [7]+216, figs. 24; 1935, pp. [7]+208, figs. 24*).—The first of these supplements contains 49 standards adopted or revised on September 1, 1934. The second contains 36 standards as of September 3, 1935.

Fire resistance of some floor constructions supported by steel beams and theoretical determination of time-temperature curves, R. Schlyter and N. Odemark (*Statens Provningsanst., Stockholm, Meddel. 65 (1935), pp. 51, figs. 27; Eng. abs., pp. 45–51*).—The results of a series of fire tests are reported which were conducted by the Swedish Testing Institute at Stockholm to deter-

mine the fire-resistance capacity of different types of steel beams enclosed partly or wholly in concrete. The specific aims of the tests were to determine (1) whether a steel beam encased in concrete with the lower flange unprotected could be considered a suitable construction from the point of view of fire resistance, (2) whether the demand for insulation of the lower flange with a covering of 4 cm concrete might be considered justified for ordinary fire-resisting buildings, and (3) whether the lower flange of the steel beams unprotected by concrete could possibly be suitably protected by eternit slabs, or by remaining wooden boards covered with reeds and plaster, reeding fixed with extra iron netting, or by a combination of eternit-tretong slab laid on remaining wooden boards covered with reeds and plaster. For the testing of walls the Institute has standardized a method of testing in a vertical furnace.

The results of the test in regard to the temperatures in different layers of the structures, as well as deflections and changes in length, are graphically presented. As to how long the boards with reeding and plaster on the underside of the steel beam structure protect the steel from fire, the test showed that the temperature in the lower flange rose very slowly so long as the plaster and wooden paneling adhered. This was due to the favorable insulating capacity of the wooden paneling. Up to the moment when the wooden paneling was burned away the temperature of the lower flange did not exceed 100° to 150° C. The temperature rose rapidly when the plaster and the insulating panel had burned away. After from 20 to 30 min. the temperature between plaster and wood was 300°, at which time the first crack rose in the plaster, through which the gases generated by the dry distillation of the wood forced their way. Wooden paneling, reeding, and plaster could not be calculated to protect the steel from direct contact with the fire for more than from 40 to 50 min.

A method also is presented whereby the complex mathematical formulas involved in the calculation of the rise in temperature in a wall under test as to its fire-resistant qualities may be solved graphically. It is also shown how the necessary coefficients for the practical use of this method can be determined by a comparison between temperature curves determined in an experimental way at fire tests and theoretical curves determined by graphical calculation.

Oak flooring: Commercial Standard CS56–36 (*Washington: U. S. Dept. Com., Bur. Standards, 1936, pp. II+21, figs. 4*).—This standard provides minimum specifications for commercial grades of white oak and red oak flooring. It covers length, width, thickness, defects, and bundling and the grading tolerances for these requirements.

Minimizing wood shrinkage and swelling, A. J. STAMM and L. A. HANSEN (*Indus. and Engin. Chem., 27 (1935), No. 12, pp. 1480–1484, fig. 1*).—In this report of studies at the U. S. D. A. Forest Products Laboratory it is pointed out that when either green or dry wood is impregnated with a water-insoluble oil, or molten wax, or resin, the impregnating material merely enters the microscopically visible capillary structure. Water in the fine swollen structure of the cell wall can, however, be replaced by a liquid which is completely miscible with water, and this liquid, if also a solvent for waxes and resins, can be replaced by the latter at temperatures above the melting point. This procedure has been used for getting water-insoluble waxes, oils, and resins into the intimate structure of the cell wall using Cellosolve as the intermediate solvent. Only a partial shrinkage of the wood from the green condition occurs, and the subsequent dimension changes with changes in equilibrium relative humidity are materially reduced. The process can thus serve as a combined seasoning and antishrink impregnation treatment for refractory species. Data

obtained by the ordinary impregnation method and data obtained by impregnating dry wood with the waxes and resins dissolved in wood swelling solvents are given for comparison.

Symposium on paint and paint materials (*Philadelphia: Amer. Soc. Testing Materials, 1935, pp.* [5]+*150, fig. 1*).—This symposium includes special articles on preparation, use, and abuse of specifications for paint materials, by P. H. Walker; paint testing, by C. D. Holley; varnish testing, by W. R. Fuller; lacquer testing, by H. E. Eastlack; drying oils, by S. O. Sorensen; zinc pigments, by E. H. Bunce; lead pigments, by R. L. Hallett and C. H. Rose; titanium pigments, by I. D. Hagar; the mineral earth colors and synthetic iron oxides, by J. W. Ayers; chemical colors, by A. F. Brown; natural and synthetic resins, by W. T. Pearce; lacquer solvents and volatile thinners, by R. M. Carter; and turpentine and petroleum distillates as thinners for varnish and paint, by J. M. Schantz.

Cetane rating of Diesel fuels, P. H. SCHWEITZER and T. B. HETZEL (*S. A. E.* [*Soc. Automotive Engin.*] *Jour., 38 (1936), No. 5, Trans., pp. 206–214, figs. 10*).—In the testing method described in this paper, a contribution from Pennsylvania State College, the moment of ignition is determined by a mechanism consisting of a diaphragm in the cylinder head, a phonograph pick-up, a short stiff wire transmitting the motion of the diaphragm to the pick-up, a thyratron relay, and a neon lamp protractor. When ignition occurs in the cylinder the flexing velocity of the diaphragm is sufficiently high so that the voltage generated in the coil of the pick-up trips the thyratron tube and permits a high-tension condenser discharge to be sent through the neon lamp, which by its flashes then indicates the time of ignition.

Because of the absence of friction and arcing the action of the pick-up is more regular than that of a bouncing pin. A similar pick-up is used for indicating injection timing. Using this apparatus and the fixed-ignition-lag method, the Diesel fuel testing in the C. F. R. engine has been so simplified that seven to eight fuels can be tested in an hour with a high degree of reproducibility.

Empirical ratings such as aniline point, Diesel index, viscosity-gravity index, and viscosity-slope index were applied to 19 fuels, and none of them was found to offer a perfect substitute for engine testing. Some can, however, be recommended for approximate rating.

Combustion knock was found to decrease only slightly when the cetane number of the fuel exceeded 55. Cathode-ray oscillograms would indicate that the knock follows the maximum rate of pressure rise more than the ignition lag.

The Purdue plow trash shield, R. H. WILEMAN (*Indiana Sta. Circ. 217 (1936), pp. 4, figs. 4*).—This shield is briefly described and illustrated. It is constructed of sheet metal shaped to form a hood over the top side of the furrow slice as it is turned over. The rear edge of the shield is bent down so that it is perpendicular to the ground surface. This edge is irregular in shape and conforms to the contour of the turning furrow slice. The shield is hinged at the lower front corners and is free to rise and allow any obstruction to pass under it.

Care and maintenance of cotton-gin saws and ribs, C. A. BENNETT and F. L. GERDES (*U. S. Dept. Agr. Circ. 393 (1936), pp. 20, figs. 12*).—Comparisons of the results of ginning tests with gin saws in good and in poor condition showed an average difference in the monetary value of the lint of more than $2 per bale with cotton 1⅛ in. and longer and of about $1 per bale with cotton shorter than 1⅛-in. staple length.

The greatest factor in raising the value of the bale was the greater lint turnout with the good saws. The saws in good condition ginned the seed closer than

the worn saws, resulting in an average difference for all cottons and conditions employed in this study of about 10 lb. of lint per 1,500 lb. of seed cotton. The second factor was the enhancement in grade. Increase in staple length was of only minor importance.

Using saws in poor condition as compared to the saws in good condition increased the time of ginning about 30 percent with the longer and about 20 percent with the shorter staple cottons. Although the power requirement was slightly less with worn saws, the energy consumption was equal or greater because of the added ginning time.

Sharpening procedure with some machines comprises only a 2-stage gumming and side dressing; while with others it is a 3-stage gumming, side-dressing, and filing or sand-box operation. For hand-picked short-staple cottons and for all roughly harvested cottons the 2-stage method is usually sufficient, but the 3-stage method is to be recommended for hand-picked long-staple cottons.

Gin saws handling roughly harvested cotton require more frequent sharpening than those handling clean-picked cotton, and increase in percentage of damp or wet cotton for either method of harvesting increases the damage to the saw teeth and the frequency with which they must be reconditioned.

The best method of keeping gin saws in proper condition and protecting them from rust during the idle season is to cover them wtih a coat of suitable oil, which can be easily removed at the beginning of the next ginning season.

Gin ribs require periodic attention in order to preserve the essential relations with the saws that contribute to smooth and satisfactory ginning. The saws should revolve in a central position between each pair of ribs, or with a space equal to a saw thickness on each side, to prevent dragging of the teeth against the ribs and the consequent adverse effects on both cotton and saws.

Worn ribs may be replaced by new ones or repaired by various methods. These repairs consist of welding new materials upon the worn spots to build up the ribs, followed by grinding to correct dimension and shape; or covering the worn surfaces with hardened plates of suitable width and minimum thickness to once more give well-defined edges to the ribs. A smooth polish on the ribs contributes to good ginning and can be preserved from season to season by coating with oil.

Farm buildings, J. C. WOOLEY (*Columbia, Mo.: Univ. Coop. Store, 1936, pp. [6]+266, figs. 221*).—This is a compilation of information on farm structures, presented with the idea of reviewing the underlying science involved and finding its application to the conditions imposed by the different structures. It is divided into chapters on the development of farm buildings in America; the function of buildings in the business of farming; heat—its production, measurement, and transfer; heat transfer through separating mediums; heat relationship in farm buildings; moisture in farm buildings; the comfort zone; ventilation systems; mechanics of farm buildings; design of structural members; barn frames; gable—combination and shed rafters; gambrel, gothic, and hip rafters; wood as a building material; concrete; brick blocks and steel; cobblestone, rammed earth, and log construction; siding, roof covering, and insulating material; location and planning the farmstead; machinery storage and repair buildings; planning buildings for the dairy enterprise; dairy barns and milk houses; silos; buildings for the poultry enterprise; buildings for the hog enterprise; beef cattle and sheep barns; horse barns and general-purpose barns; grain and hay storage buildings; storage structures for fruit and vegetables; the farm home; heating the farm home; water systems; disposal of waste from the home; remodeling, care, and repair of buildings; cost of new and appraisal of old buildings; fencing the farm; and drafting and interpretation of plans.

The disposal of wastes from milk products plants, E. F. ELDRIDGE (*Michigan Sta. Spec. Bul. 272 (1936), pp. 18, figs. 7*).—Technical information is presented on the elimination of loss of milk solids within the factory and the safe treatment of solids which cannot be economically saved.

It is pointed out that a large share of the milk solids in the wastes of many factories comes from the can washer. Usually about 1 lb. of milk is lost for every 9 cans washed, and some plants wash as many as 2,000 cans daily. These solids are discharged over a 3- to 4-hr. period and would require a stream having a minimum flow of about 55 cu. ft. per second for satisfactory dilution.

Every washer should be provided with a drip collector, as one-half of the milk lost through the can washer may be prevented by collecting the drip. Of the remainder, 80 percent may be saved by collecting a short cold water rinse of the cans, but the disposal of this rinse may be difficult and its collection may or may not be practical. In some cases, however, its elimination from the wastes may avoid the cost of building treatment units, and in such cases it could be mixed with the drippings and sold or given to the producer for feeding purposes.

The drainage from storage tanks, coolers, churns, vats, and other equipment should be collected in cans and either returned to the product or used for feeding purposes. A cold water rinse of these units may also be collected and used.

Skim milk, buttermilk, and spoiled milk should be considered byproducts and should never be discharged into the factory sewers. These byproducts are highly concentrated, and treatment processes for wastes including them are costly.

Whey and cheese washings are also concentrated, and wherever possible should be used either for the manufacture of other products or for feeding. A limited amount of whey and washings may be treated. Considerable effort should be spent in finding an outlet for the whey and as much of the first washings as is possible. These efforts will be amply repaid by the savings in the cost of the treatment required for the factory wastes.

It has been found that the septic process cannot be successfully applied to milk waste, since products are formed by the septic fermentation of milk solids that are much more detrimental to the stream than are the fresh solids.

In the case of small plants located on farms or in sparsely populated districts, irrigation may be used as a means of waste disposal. This method consists of pumping or otherwise spreading the waste onto several acres of land that are kept under constant cultivation. Provision must be made to apply the waste to various portions of the field on alternate days so as to allow the waste to seep into the soil before a second application is made. Sandy soil is best adapted for this practice. Should odors become obnoxious, chloride of lime, sodium hypochlorite, or liquid chlorine may be applied to the waste before it is pumped to the field. Usually the method is used only during the summer months when stream flows are low.

A detailed discussion is presented of the design, construction, and operation of a biological filter for milk waste disposal. This method of disposal consists of the intermittent application of the waste to a filter composed of gravel or crushed stone. The treatment plant necessary for the biological filtration of milk waste consists of three units. These are (1) a holding tank to equalize the waste and to give a longer operating period for the filter, (2) the filter, and (3) a settling tank to remove the suspended material from the waste discharged by the filter.

Directions are given for a method of making the 5-day biological oxygen demand determination, which is considered the essential test to determine the strength of the wastes and the efficiency of the filter.

AGRICULTURAL ECONOMICS

Agricultural economic facts basebook of Iowa, L. K. Soth (*Iowa Sta. Spec. Rpt. 1 (1936), pp. 179, figs. 192*).—"The purpose of this basebook is to make available to farmers, as well as to students of agricultural affairs, economic facts and figures which pertain to the agriculture of Iowa. The statistics and analyses which make up this book deal with and describe chiefly those economic forces which are outside of the province of any individual farm." It was prepared by the rural social science and economics section of the station and the extension service of the Iowa State College of Agriculture and Mechanic Arts. The eight chapters include data on the following and related subjects:

Iowa farm income.—Included are 11 tables and 8 charts and maps on farm value and gross and cash income from different farm products, farm expenditures, monthly receipts of income, farm income of Iowa counties, monthly indexes of income of industrial workers and of cash income from sale of farm products in the United States, etc.

Iowa farm prices.—The 11 tables and 15 charts show, for periods of years, the monthly prices and index numbers of prices paid Iowa farmers for different products and indexes of farm product prices in the United States, corn-hog ratios in Iowa and at Chicago, purchasing power of Iowa hogs and corn, and prices paid by farmers for different commodities in Iowa and in the United States.

Iowa farm production.—The 39 tables and 85 charts and maps included present data on the numbers and value of different kinds of livestock on Iowa farms; monthly marketings total and to stockyards and packing houses of hogs, cattle, and sheep; production of creamery butter and shipments of butter, dressed poultry, and eggs to New York, Philadelphia, Chicago, and Boston; the acreages, yield, and value of leading crops, 1880–1934, for the State by years and by counties for 1932 and 1933; and acreages of crops in the United States, by States, and the production, 1933–34, by countries of the world.

Iowa farm real estate.—The 29 tables and 19 charts and maps include data as to land values; acreages operated by owners, part owners, managers, and tenants; cash rents; use of lands; lands owned by corporations; amount, sources, and purposes of farm loans; mortgage foreclosures; deficiency judgments; etc.

Iowa farm taxes.—Sixteen tables and 9 charts and maps present data as to taxes per acre, tax paying power of Iowa farm products, income and expenditures of Iowa administrative units, tax delinquency, etc.

Types of farming in Iowa.—The 3 tables and 28 maps in this chapter show the soil types, extent and seriousness of soil erosion, rainfall, temperatures, size of farms, use of lands, acreages and yields of different crops, feed units per acre produced, animal units per acre, milk production, etc., in the different type-of-farming areas of the State.

Iowa farm home conveniences.—The 15 tables and 13 charts and maps present data as to ownership, value, construction, age, condition, number of rooms, etc., of houses, number of conveniences of different types, etc.

Iowa population.—The 8 tables and 15 maps and charts present data as to distribution, constituency, changes in, etc., of the population of the State.

Current Farm Economics, Oklahoma, [August 1936] (*Oklahoma Sta., Cur. Farm Econ., 9 (1936), No. 4, pp. 81–101, figs. 3*).—Included, besides the usual tables showing price indexes in the United States and Oklahoma and of purchasing power of Oklahoma farm products, are articles on the general economic situation and the agricultural situation in Oklahoma, by T. R. Hedges;

Social Aspects of Rural Shifts of Farm Population in Oklahoma, by O. D. Duncan (pp. 88–93); Some Factors Associated With Profitableness of Northwestern Oklahoma Farms During 1935, by E. D. Hunter (pp. 94–96); and Oklahoma has Radically Changed Its Tax Machinery the Past Five Years, by J. T. Sanders (pp. 97–99).

Methods employed by geographers in regional surveys, G. D. HUDSON (*Econ. Geogr., 12 (1936), No. 1, pp. 98–104, figs. 5*).—Some of the more recent methods for gathering and recording data and portraying distributions are described.

Readjusting Montana's agriculture, VII, VIII (*Montana Sta. Buls. 318 (1936), pp. 19, figs. 6; 319, pp. 27, figs. 13*).—These bulletins continue the series previously noted (E. S. R., 75, p. 250).

VII. *Montana's dry-land agriculture,* E. A. Starch.—Information is presented as to crop acreages, yields, and production; the relationship between wheat yields, grades of farm lands, and the economic limits of the lower grades of lands for farming purposes; present farm enterprises; farm practices and size of dry-land farms; the possibility of economic readjustments; and the adjustments needed to afford adequate farm income.

VIII. *Tax delinquency and mortgage foreclosures,* R. R. Renne.—Data are presented regarding the extent of, increases in, and causes of farm tax delinquencies and farm mortgages and foreclosures. Measures for reducing tax delinquency and farm debt adjustment are discussed.

An analysis of the present status of agriculture on the Sun River irrigation project, P. L. SLAGSVOLD (*Montana Sta. Bul. 321 (1936), pp. 60, figs. 15*).—This analysis is based on annual farm census and other reports for the project, data furnished by farmers, the soil survey previously noted (E. S. R., 60, p. 116), climatological data in U. S. D. A. Weather Bureau publications, and tax data obtained from county officials and reports of the Montana State Board of Equalization.

The development and present status of the project, the climate, soil, topography, water supply, irrigation, drainage, transportation facilities, markets, and operation and maintenance charges of and the tax levies on the project are discussed. Data are included and discussed on acreages and yields of crops, numbers of different kinds of livestock, acreages irrigated, tenure of farm operators, crop and livestock combinations, etc. Budgets for 80-, 100-, 120-, and 160-acre farms showing livestock inventories and feed requirements, cropping programs, yields, and costs, and farm income and farm expenses by items are presented to test the relation of size of farm and net income.

An economic study of land utilization in Broome County, New York, T. E. LAMONT ([*New York*] *Cornell Sta. Bul. 642 (1936), pp. 51, figs. 16, map 1*).—This bulletin is the fourth in the series previously noted (E. S. R., 75, p. 270).

"About 27 percent of the county is in land class I, and 23 percent in land class II. Most of land class I is idle or in woods, and is primarily adapted to forestry and recreational uses. A large amount of land class II is idle or in woods, but on a considerable part farming is still being carried on. It is better suited to forestry and recreational uses than to agriculture.

"Land in classes III and IV is land that is adapted to permanent agriculture; about 44 percent of Broome County is in these land classes. The higher the land class, the more intensively the land is used.

"Most of the soils in land classes I and II are poorly drained upland soils; in land class IV, about 60 percent are well-drained valley soils.

"In land classes I and II, a large proportion of the houses standing 30 yr. ago are gone, falling, or vacant; of the operated farms, more than three-

quarters were classed as poor. In land class IV, most of the farms were classified as good or excellent.

"The full assessed value of land class I was $12.11 per acre, and in land class II, $18.47. The higher the land class, the higher the full value; land class IV averaged about $47 per acre.

"Practically all farms that will remain in agriculture permanently should be served by hard roads, electric lines, and other modern services. In land classes III and IV, about 54 percent of the farms were on dirt or gravel roads, and 57 percent did not have electric service available in 1933. Suggested road and electric programs have been prepared so that practically all the farms in these land classes . . . will be served by hard roads and electric lines."

An economic study of land utilization in Tioga County, New York, P. B. JONES ([*New York*] *Cornell Sta. Bul. 648 (1936), pp. 40, figs. 16, map 1*).—This bulletin is the fifth in the series noted above. About 68 percent of the county is in land classes I and II, and about 30 percent in land classes III to V.

"In land classes I and II, a large proportion of the houses standing about 30 yr. before were gone, falling, or vacant, and of the occupied farms, 83 percent or more were classed as poor or fair to poor. In land classes III to V, a large proportion were classed as good to excellent. Also, in the higher land classes there were more buildings per square mile.

"The assessed full value per acre of land class I was $10.35, and land class II $15.04. The higher the land class the higher the value; land class V averaged about $60 per acre. Farms located wholly in land classes I and II made up 51 percent of the county area, but only 7 percent of the total full value. About 23 percent of the tax base was represented by all classified land, 26 percent by public utilities properties, and 51 percent by residential and industrial properties. A large proportion of the public utilities were railroads. . . .

"In land classes III to V, about 31 percent of the farms were on dirt or gravel roads and 58 percent did not have electric service available in 1934. Suggested road and electric programs have been prepared."

Montana land ownership: An analysis of the ownership pattern and its significance in land use planning, R. R. RENNE (*Montana Sta. Bul. 322 (1936), pp. 58, figs. 16*).—This is an expansion of Bulletin 310 (E. S. R., 75, p. 270), including additional details and discussing more completely the social and economic implications.

Of the total area of the State, approximately 44 percent was owned by public agencies in 1934 (Federal Government 35.6, State 5.7, and counties 2.7), 14 percent by corporations, 30.8 percent by private individuals resident in the State, and 10.9 percent by nonresidents of the State.

Tax delinquency and mortgage foreclosures were the principal immediate causes of changes in ownership. The fundamental causes were overspeculation in land, overdevelopment in local government, and improper utilization of land. Considerable progress has been made in establishing a planned use of lands through (1) consolidation of farms by more successful farmers taking over abandoned lands, (2) formation of cooperative grazing districts, (3) control of public ranges through the Taylor Grazing Act, and (4) blocking lands into economic units through purchase of selected areas by the Federal Government.

Inventory of land use in Tennessee.—A preliminary report, C. E. ALLRED, S. W. ATKINS, W. P. COTTON, and J. E. MASON ([*Nashville*]: *Tenn. Welfare Comm., 1936, Rpt. 5, pp.* [*1*]+*38, figs. 22*).—According to this report, in which the Tennessee Experiment Station cooperated, in Tennessee 49.6 percent of the

total land area is woodland. Cropland occupies 28.7 percent, pasture land (exclusive of woodland pasture) 13.6, farmsteads and farm roads 4.8, public roads and railroads 1.5, towns and cities 0.5, lands of little or no use 0.3, and miscellaneous 0.9 percent.

Regional grouping of crop production in Tennessee.—A preliminary report, C. E. ALLRED, W. E. HENDRIX, and B. H. LUEBKE ([*Nashville*]: *Tenn. Works Prog. Admin., 1936, Rpt. 12, pp. III+38, figs. 23*).—The principal areas have been classified into three groups—group 1, those areas which, in general, rank highest in agricultural productiveness; group 2, those which are intermediate; and group 3, those which rank lowest.

The percentage of total land area in crops, pasture, and woodland is determined to a great extent by the productiveness of the region. Cropland, which constitutes the most intensive of the three major land classes, comprises 41.4 percent of the total land area in group 1, 32.3 percent in group 2, and 17.2 percent in group 3. The percentage of total land area in pasture is high (19.8) on group 1 land and low (6) on group 3 land, and is highest in areas having a large acreage of fertile land which is interspersed with and adjacent to uncultivatable or poor land. All-hay crops comprise 24 percent of the cropland harvested in group 1, 21.9 percent in group 2, and 19.8 percent in group 3. Alfalfa and timothy are grown principally on the group 1 soils and wild grasses on group 3 soils.

Farm tenancy in Tennessee, C. E. ALLRED, W. E. HENDRIX, and B. D. RASKOPF (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Rpt. 17 (1936), pp. III+31, figs. 16*).—In May 1935, the relative relief burden was greater among farm tenants than among farm owners. Farm owners free of debt and operating farms large enough to constitute economic units of operation generally were not dependent on relief funds. Farm tenant families of both the general population and the relief population were larger than owner families, and relief families were larger than nonrelief families.

The standard of living of farm tenants of the general population was considerably lower than that of owners. Though higher for owners than for tenants, the differences in living standards were not so great among negroes. Low educational attainment is characteristic of farm tenants compared with farm owners. In 1930, 37.4 percent of all farm tenants and 43.9 percent of cropper tenants had changed farms within the past year, compared with 6.2 percent of farm owners.

Farm tenants of both the general and the relief population were younger than farm owners. The relief rate in general was less among negro farmers than among white farmers.

Cropper tenants constituted 44.3 percent of all tenants in the State, and were found mainly in the cash-crop production areas, and were a heavier relief burden than other types of tenants. Croppers constituted 61 percent of the negro tenants and 39 percent of the white tenants.

Almost one-half (46.2 percent) of all farms in Tennessee were operated by tenants in 1930. The greatest concentration of farm tenants was in the extensive cotton growing counties of west Tennessee and in the dark fire-cured tobacco growing area of the Northern Highland Rim. Among negro farmers the percentage of tenancy was considerably higher than among white farmers, 77 and 44, respectively. About 34 percent of all farm tenants in Tennessee were cash tenants in 1880. This percentage declined to 10 in 1925 and increased to 10.8 in 1930.

Farm tenants (other than cash and cropper) constituted 44.9 percent of all tenants of the State. They are found mainly in the counties of the Western

Highland Rim, eastern part of west Tennessee, and North Eastern Highland Rim.

Inequalities arising from the assessment of farm real estate in South Dakota, R. B. WESTBROOK and N. V. STRAND (*South Dakota Sta. Bul. 300 (1936), pp. 39, figs. 6*).—Data were obtained as to the sale price of 1,758 bona fide transfers of farm real estate during the period 1925–34 in 20 counties and as to the assessed valuations of the properties of the date nearest the time of the sale. These data are analyzed on a State-wide basis and by counties. Tables and charts show on a State-wide basis the average levels of assessment, average deviations, and coefficients of dispersion for the properties grouped on the basis of percentage of average farm value and of average acre value. Other tables show similar data by counties for the farms grouped on the basis of sale value. Defects in the present system of making assessment are discussed, and suggestions made for an improved system.

Of the 1,758 farms, 13 percent were assessed at from 10 to 60 percent of their sale value, 40 percent at from 60 to 100, 38 percent at from 100 to 200, and 9 percent at from 200 to 350 percent. Low value farms tended to be overassessed, and high value farms to be underassessed. Levels of assessments varied appreciably among the counties. The better and older farming areas were found to be less subject to variations in assessments than were the sections in which land values were not so well established.

Farm taxation (*Rhode Island Sta. Rpt. [1935], pp. 4, 5*).—Additional data (E. S. R., 73, p. 703) are reported on real estate taxes in Rhode Island.

Comparative ability of Tennessee counties to finance their governmental functions.—A preliminary report, C. E. ALLRED, S. W. ATKINS, J. H. MARSHALL, W. E. COLLINS, and C. A. TOSCH ([*Nashville*]: *Tenn. Welfare Comm., 1936, Rpt. 9, pp. [III]+44, figs. 17*).—The purpose of this preliminary study, in which the Tennessee Experiment Station cooperated, is to ascertain the relative ability of Tennessee counties to finance their governmental functions. This ability is estimated on both a county total and a per capita basis. Slightly more than one-fourth of the total financial capacity of the State is in four counties and one-third is in seven counties. The principal causes of these differences are natural resources, such as soil and topography, size of counties, and the extent of urban development. Among other important factors are public debt, tax levy, and the need for additional expenditures for highways and school buildings.

[Investigations in farm management by the Indiana Station, 1934–35] (*Indiana Sta. Rpt. 1935, pp. 37–40, fig. 1*).—Brief summarizations are included of the findings not previously noted in studies of (1) costs of producing potatoes, tomatoes, and onions in northern Indiana; (2) farm buildings on 144 farms in Benton and Whitley Counties; (3) the influence of farm practices on incomes on 40 central Indiana farms; (4) the value of farm machinery and minor equipment in 1934 on 370 farms in 4 type-of-farming areas of the State; (5) combine harvester thresher costs in 1934 of 27 cooperators; (6) labor, power, and machinery costs on 425 farms in 1933; (7) real estate prices and transfers in 1933 in 4 central Indiana counties; and (8) the effects of soil type and pasture practices in Monroe and Lawrence Counties.

Part-time farming in Indiana, F. V. SMITH and O. G. LLOYD (*Indiana Sta. Bul. 410 (1936), pp. 28, figs. 6*).—"The objectives in this study were (1) to recognize the extent and geographical location of part-time farming in Indiana, (2) to appraise the social and economic characteristics of typical part-time farm families, (3) to determine the net effect of the farm enterprises on the economic condition of part-time farm families, and (4) to obtain facts indicat-

ing the types of situations to which part-time farming is adapted and the types of farm enterprises which are most effective."

Records for the calendar year 1933 were obtained for 1,508 farms in three areas—industrial, limestone, and coal mining—of the State. Of the farms, 428 were less than 3 acres in size; 416, 3 and less than 10 acres; and 664, 10 and less than 51 acres in size. Of the farms 1,193 were owner-operated and 315 tenant-operated. Tables show by size-of-farm groups the average size and utilization of lands; date of purchase, average purchase price, 1933 value, of dwellings and of land, mortgage indebtedness, etc., of owner-operated farms; amount of indebtedness of owners and tenants; numbers of horses, hogs, cows, and hens; acreages in gardens and crops; facilities—kind of road, household conveniences, and automobiles; cash income from farm products sold, occupation away from the farm, and from other sources; value of farm products of different kinds produced and sold; farm expenses of different kinds; etc. Data as to size of family, age of the head of the family, kind and condition of the houses, school attendance, standard of living, occupations other than farming, taxation delinquency, etc., are presented in the text.

The farms averaged 13.09 acres, of which approximately ⅔ acre was in vegetable crops, 4 acres in harvested crops, and 8½ acres in pasture, woods, farmstead, idle, waste, etc. Of 1,193 owner-operated farms, 588 were purchased from 1919 to 1928 and 338 from 1929 to 1933. Of the 1,508 farms, 99 percent had gardens, 87 poultry, 67 at least 1 cow, 42 hogs, and 28 percent horses. Approximately 54 percent of the part-time farmers were employed in industry, 15 percent had a business of their own, and 30 percent were engaged in nonagricultural occupations. An average of $201 worth of farm products was produced per farm. The average income earned away from the farm was $487. Approximately 31 percent of the real income of the family came from the farm. The average net income was $97 for owner-operators and $70 for tenants. The average total living cost per family was $436. The average cost of food purchased, $198, was approximately equal to the value of products produced.

Other findings were that part-time farming tends to develop on both submarginal and good agricultural lands. The number per square mile and the size of and volume of agricultural enterprises on part-time farms are greater in Indiana in areas of greatest urban and industrial development. The average value of dwellings on the farms studied was greater than the value of land and other buildings, indicating that the part-time farm is primarily a home rather than a business. The part-time farms surveyed were rather advantageously located as regards good roads, schools, trading centers, and places of nonagricultural employment. The more-than-10-acre group of farms had the highest net income. The standard of living maintained by the part-time farm families indicates that in most instances such families are not an undesirable element in the commmunity. Part-time farmers have increased the taxable wealth of many communities. Part-time farming affords a certain economic stability for the wage earner, and in many instances enables him to provide better food and living conditions for his family. Under present conditions, part-time farmers do not seriously compete with full-time farmers. The average part-time farmer should have a reasonable assurance of at least 120 days per year of gainful employment away from the farm or a farm business large enough so that the sale of products is a major source of cash income.

The economics of bean production in Michigan, K. T. WRIGHT (*Michigan Sta. Spec. Bul. 270 (1936), pp. 46, figs. 14*).—This bulletin gives general information regarding the bean industry, including world, United States, and Michigan production, the acreages, yields, and prices by States, and monthly prices in

Michigan, and analyzes the data regarding costs and returns in bean production in Michigan obtained from 166 farm records for 1929, 97 for 1930, 103 for 1931, and 65 for 1932. Tables for each year and for the periods show for all the farms, for those on Brookston, Miami, and sandy soils, and for those growing red kidney beans, by items, the average growing, harvesting, and overhead costs and returns per acre, the profits and losses per acre, and the labor and power requirements. Other tables show for pea beans on all farms the effects on costs and returns of different factors—yield, dates of plowing and planting, drainage and value of land, variety of beans raised, use of green and barnyard manure and commercial fertilizer, acreage of beans per farm, efficiency in use of labor, power, and machinery, and the cumulative effects of good growing practices.

The average costs per acre of producing pea beans were 1929, $36.17; 1930, $28.41; 1931, $24.60; and 1932, $20.40. The average returns were $11.41, $22.26, $16.01, and $14.34. The average yields per acre were 12.1, 9.4, 14.1, and 22.1 bu., averaging 13.2 bu. for the period. The returns per hour of labor were 20 ct. Of the average total costs labor, power, and machinery made up 43 percent, land use 22, manure and fertilizer 15, seed 10, and threshing and other costs 10 percent. The returns per hour of labor averaged 29 ct. on the Brookston soils, 9 ct. on the Miami soils, and —9 ct. on the sandy soils. The returns for red kidney beans averaged 23 ct.

The author concludes that in the immediate future the total production cost will probably be 15 percent lower than the 1929–32 average, that bean prices will probably not average higher than the average for the 4 yr.—$3.38—and that the possibility of profits from beans is very limited when the yield is not greater than the 10-yr. State average of 10.7 bu. He adds that "growers using good practices and efficient methods and obtaining good yield can reasonably hope for a fair management return."

Cotton production in Mexico, P. K. Norris (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Agr. Serv., 1935, F. S. 65, pp. 15, fig. 1*).—Statistics covering a number of years on the acreage, production, and yields of cotton are included. The factors affecting the production and different cotton-growing districts are described, and the outlook for increased production is discussed.

Quality of lettuce as it affects the New York lettuce industry, J. E. Knott ([*New York*] *Cornell Sta. Bul. 651 (1936), pp. 17, figs. 9*).—Yearly carload shipments of lettuce originating in New York decreased from an average of 3,447 cars for the period 1927–29 to 1,555 cars for the period 1932–34, while those from western States decreased from 44,900 to 42,332 cars. This bulletin reports results of the study made to determine some of the factors that might be related to the decline in lettuce production in New York. It is based chiefly on data for the period 1927–35 obtained from 15 selected growers at Elba and Oswego who were careful of the quality of their pack and 15 growers who were inclined to be careless in packing. Some data were also used from a quality price study including 40 growers at Fulton in 1932, and one made by O. W. Terry in 1935 including 28 growers in Oswego County. The practice of distributing shipments in different cars with a view to avoiding a low return for poor quality is discussed.

Poor packers on an average receive a lower price for their lettuce than did good packers each year 1927–35, the differential being 15 ct. or more in 4 of the 9 yr. In only 24 of the 96 weeks in the 9 shipping seasons did 50 percent of the shipments of poor packers bring more than the average weekly price, while over 50 percent of the shipments of good packers brought more than the average weekly price in 75 of the 96 weeks.

Methods of securing better packing are discussed. The author concludes that "more important than this packing of two grades, however, is the necessity for allowing the lettuce to reach the proper degree of maturity before it is cut, and the elimination from the market of all lettuce that is loosely headed. Unless definite measures are taken by growers consistently to ship a high-quality pack and so to develop and maintain a good reputation for New York State lettuce, this industry in New York State cannot possibly be restored to its proper place in consumer markets."

1935 onion costs of production in Michigan, K. T. WRIGHT (*Michigan Sta. Quart. Bul., 18 (1936), No. 4, pp. 238–240*).—Records were obtained from 40 growers. Analysis is made of the different items of cost and comparisons made with the findings in a similar study in 1934. Comparison was also made between the costs on the 10 low-cost and the 10 high-cost farms in 1935.

Costs of producing and marketing sugar beets in Michigan in 1935, K. T. WRIGHT (*Michigan Sta. Quart. Bul., 18 (1936), No. 4, pp. 235–238*).—Records were obtained from 95 farmers. Analysis is made of the yields per acre, amounts and cost of contract labor, and marketing costs. Comparisons are made with a similar study in 1934.

Economic studies of dairy farming in New York.—XII, 150 farms in the Tully-Homer area, crop year 1931, J. R. RAEBURN ([*New York*] *Cornell Sta. Bul. 644 (1936), pp. 53, figs. 16*).—This bulletin is the third in the series previously noted (E. S. R., 69, p. 454). The study is based on records for the year ended March 31, 1932, obtained from 101 farms producing grade A milk and 49 farms producing grade B milk. Price and weather conditions, amounts of farm capital, receipts, expenses, etc., on the types of farms are discussed. An analysis is made of the factors affecting labor income and the costs and returns in milk production. Comparisons are made with the findings in the previous studies.

The average labor income of the operators was $390 on the grade-A-milk farms and −$130 on the grade-B-milk farms. A 10-percent-of-average increase in the number of cows or in labor employed was accompanied on the grade A farms by an increase of about $60 in the labor income, but on the grade B farms a 10-percent-of-average increase in the number of cows had no effect on labor income and a similar increase in labor reduced the labor income $51. On the grade A farms an average of 40 tons of milk was produced per man employed and 6,884 lb. per cow, as compared with 34 tons and 6,717 lb., respectively, on the grade B farms. An increase of 10 percent of average in the number of animal units per man, the milk yield per cow, and the resultant of these two—the rate of milk production per man—increased the labor income more than $140 on grade A farms and more than $50 on grade B farms. The acreage of crops per man, cash-crop yields, and cattle increase per cattle unit had little relation to labor income. Such incomes were high where feed-crop yields were high. Satisfactory labor incomes were obtained only where the value of all farm labor was less than 30 percent of the total receipts and where grade A premiums were obtained.

"The average net cost per hundredweight of milk sold was $2.17 for grade A milk and $2.14 for grade B milk. The average price received was $1.95 per hundredweight for grade A and $1.71 for grade B. The return per hour of labor was 22.4 ct. in grade-A-milk production and 12.6 ct. in grade-B-milk production. Total feed costs made up about 42 percent and total labor costs about 30 percent of the cost of both grade A and grade B milk. In herds of less than 16 cows, the net cost of grade A milk was $2.49 and of grade B milk $2.75 per 100 lb. In herds of 26 or more cows, the net cost was $2.13

for grade A milk and $1.91 for grade B milk per 100 lb. Net cost of production decreased from $2.33 to $1.99 per 100 lb. in grade A herds and from $2.52 to $1.94 per 100 lb. in grade B herds as milk yields increased from less than 6,500 lb. to 7,500 lb. and more. Labor efficiency in milk production, as measured by tons of milk produced per man, was an important determinant of cost of production. The net cost per 100 lb of milk sold decreased from $2.41 to $2.01 for grade A milk and from $2.51 to $1.76 for grade B milk as tons of milk per man increased from less than 35 to 45 or more. Returns per hour of labor increased from 12 ct. to 36 ct. with grade A milk and from 2 ct. to 24 ct. with grade B milk. Net production costs per 100 lb. for grade A milk decreased from $2.41 to $2.11 and net returns increased from $1.92 to $2.01 as the proportion of the total milk sold that was sold from September to December increased from 27 percent to 38 percent."

Studies in Vermont dairy farming.—IX, The Champlain Valley during a major depression, J. A. HITCHCOCK and S. W. WILLIAMS (*Vermont Sta. Bul. 405 (1936), pp. 24. figs. 2*).—This bulletin continues the series previously noted (E. S. R., 72, p. 123). The study, which deals with the dairy farm management conditions during the year ended March 31, 1933, is based on data regarding 448 herds. The physical and agricultural characteristics of the area are described. An analysis is made of the effects of production per cow, labor efficiency, size of farm, and type of market upon the profitableness of the farm business.

The average receipts per farm were $1,856 and the average expenses $1,752, resulting in a labor income of —$466 if 5 percent interest is allowed on the capital investment. The labor income increased from —$674 for herds averaging less than 160 lb. of butterfat per cow to —$188 for herds averaging 250 lb. or more of butterfat per cow. The hours of labor, cost of feed, miscellaneous costs, and total cost per cow increased as production of butterfat per cow increased, but the cost per pound of butterfat decreased. The average labor incomes with different numbers of work units per man were: Less than 190 units —$482, 190–249 —$457, 250–309 —$563, 310–369 —$366, and 370 units and over —$433. The average labor income was —$186 for the farms selling their milk in a grade A market during the entire year, —$475 for those selling in such a market only during part of the year, and —$531 for those selling in a grade B market only. The average labor income decreased $17 for each additional cow, being —$818 for the farms with less than 14 cows and —$950 for those with 38 or more cows.

Milk-distribution costs in West Virginia.—II, A study of the costs incurred by 75 producer-distributors in the Clarksburg, Fairmont, Morgantown, and Wheeling markets for a twelve-month period during 1934–1935, W. W. ARMENTROUT and R. O. STELZER (*West Virginia Sta. Bul. 270 (1936), pp. 32*).—Records were obtained from 17 producer-distributors in the Clarkburg market, 24 in the Fairmont market, and 14 in the Morgantown market for the year ended March 31, 1935, and from 20 such distributors in the Wheeling market for the year ended May 31, 1935, and comparisons made with 9 milk-distributing plants in the 4 cities and of 22 plants in the State studied in 1933 (E. S. R., 73, p. 865).

The costs of distribution for the individual producer-distributors ranged from $1.06 to $3.39 per 100 lb. of milk-equivalent, averaging $1.763. Of the costs, 22.1 percent were plant costs, 68.1 delivery costs, 5.6 administration, and 4.2 percent interest. The average cost for labor was 88.7 ct., for depreciation 16, building and equipment costs 21.5, truck operation 30.3, bad accounts 9.1, interest 7.4, and other costs 3.3 ct. The average labor efficiency—number of pounds

of milk-equivalent sold per hour of labor—was 28. The total cost per 100 lb. of milk sold was $1.49 for the producer-distributors selling 35 lb. or more of milk per hour of labor, $1.79 for those selling 21 to 34 lb., and $2.38 for those selling less than 21 lb. Truck costs averaged 41.1 ct. per 100 lb. of milk, varying from 33 ct., where the producer-distributor had sufficient volume of milk to haul large loads, to 58 ct., in the case of producer-distributors having only sufficient milk for small loads. The total cost per 100 lb. of milk was $1.60 for the producer-distributors selling over 150,000 lb. per year, $1.79 for those selling 70,000 to 149,000 lb., and $2.33 for those selling less than 70,000 lb.

The average cost of distribution of the 9 distributing plants in the cities studied was $1.92 per 100 lb. of milk as compared with $1.76 for the 75 producer-distributors. The higher cost for the distributing plants was due largely to a higher wage rate, cost of pasteurization, a higher investment per 100 lb. of milk sold, the purchase of surplus milk, and the cost of special deliveries made to customers.

Agriculture's share in the national income (*U. S. Dept. Agr., Agr. Adjust. Admin., 1935, pp. II+37, figs. 21*).—"The charts and tables in this pamphlet have been assembled to present, in more or less consecutive form, material on the national income at various periods in the national life and the contribution made to that total by agriculture; the gross income of the farmers of the country; their cash income; the income available to them after meeting their production costs; the purchasing power of these different types of income; and the interrelation between the income and purchasing power of farm and city in the national economy."

Indexes of prices received by Washington farmers, C. C. HAMPSON (*Washington Sta. Bul. 328 (1936), pp. 29, figs. 7*).—Tables and charts showing the monthly indexes and weighted average index for each year during the period 1910–35 are included for the State and for each of the three types of farming districts. These indexes were computed by the method of aggregate, using the following 17 products: Wheat, oats, barley, corn, rye, all hay, potatoes, apples, beef cattle, veal calves, hogs, sheep, lambs, wool, poultry, eggs, and butterfat. The prices were those on the fifteenth of the month published in *Crops and Markets* of the U. S. Department of Agriculture. The weight used for each product was the average annual amount marketed by farmers of the State during the 5 yr. 1926–30. Tables are also included showing the weighted average annual prices, 1910–35, of the 17 products and the monthly indexes, 1910–35, of farm product prices.

"In the year 1920 agricultural prices in Washington rose to 214 percent of the average for the 5 yr. immediately preceding the outbreak of the World War, 1910 to 1914. In 1932, when farm prices were the lowest during the 26 yr. from 1910 to 1935, the index of farm product prices for Washington stood at only 60 percent of the pre-war average while the index for the United States was 65 percent of the pre-war average. Since 1933 the agricultural price level in Washington has not increased as much as that for the whole United States, indicating that agricultural prices have not been influenced as much in Washington as in other parts of the nation by farm relief and by the other factors which have operated to elevate prices of farm products generally throughout the country."

Apple prices received by Washington growers, C. C. HAMPSON (*Washington Sta. Bul. 326 (1936), pp. 59, figs. 11*).—Tables and charts are included and discussed showing by crop years 1922–33 the weighted average prices of packed apples delivered to shipping points for the Wenatchee-Okanogan district, the Yakima district, and the two districts combined (the Central Irrigated region of the State). The prices are shown for each of the 18 most important varieties

and for all other varieties combined. The data for 1928–29 to 1933–34 were obtained from the books of about 50 apple marketing organizations in the two districts. The data for the earlier years were gathered in a previous study (E. S. R., 63, p. 886). The samples included an average of 42 percent of the commercial shipments of the Central Irrigated region and 39.3 percent of the shipments of the State.

The average price of all varieties, grades, and sizes for the period was $1.05 per box. The prices for individual years ranged from 45 ct. to $1.66 per box. The average for the period 1922–29 was $1.23 and for the period 1930–33 72 ct. The average for Extra Fancy apples was $1.24, Fancy apples 95 ct., and grade C apples 75 ct. Of the apples 40 percent averaged Extra Fancy, 38 percent Fancy, and 18 percent grade C, and the remaining 4 percent were packed in miscellaneous grades. The average prices for the four leading varieties, which made up 87.2 percent of the shipments for the period 1929–33, were approximately as follows: Winesap $1.06, Delicious $1.40, and Jonathan and Rome Beauty 84 ct. The spread between the price of Delicious and those of other varieties has been decreasing since 1924. The average prices for the 12-yr. period for packed apples of the same varieties and similar quality were practically the same in the two districts.

An analysis of the prices received for canned Bartlett pears by canners on the Pacific coast—seasons, 1924–25 through 1935–36, H. J. STOVER (*California Sta. Mimeogr. Rpt.* [*49*] (*1936*), *pp.* [*1*]+*19, figs.* 7).—Analysis is made of the packs, carry-overs, shipments, prices, etc., of canned Bartlett pears, the levels of consumer incomes, prices of competing canned fruits, and other factors and their effects on the average f. o. b. prices received by Pacific coast canners of Bartlett pears.

Agricultural adjustment, 1933 to 1935 (*U. S. Dept. Agr., Agr. Adjust. Admin., 1936, pp. XVI*+*322, figs. 10*).—This report of the administrator of the Agricultural Adjustment Administration covers its activities "during the calendar year 1935, and to some extent is a review of the entire 3-yr. period beginning with passage of the Agricultural Adjustment Act in May 1933." The chapter headings are as follows: Production planning, replacement crops, agricultural-industrial relations, surplus-removal operations, commodity loans, consumers' counsel, agricultural exports and imports, legal aspects of administration, financial report, cotton, wheat, corn and hogs, tobacco, sugar, cattle, rice, peanuts, potatoes, rye, dairy products, and general crops. Appendixes include tables showing the tax collections and refunds by commodities and States; processing taxes, dates effective, and rates; and the expenditures by States for general administration and rental and benefits. The amount of trust fund operations is also shown.

Cooperation in agriculture, compiled by C. GARDNER (*Farm Credit Admin.* [*U. S.*], *Coop. Div., Bul. 4* (*1936*), *pp. III*+*214*).—An enlarged edition of this selected and annotated bibliography with special reference to marketing, purchasing, and credit (E. S. R., 56, p. 889).

Statistics of farmers' cooperative business organizations, 1920–1935, R. H. ELSWORTH (*Farm Credit Admin.* [*U. S.*], *Coop. Div., Bul. 6* (*1936*), *pp. IV*+*129 figs. 46*).—A statistical presentation of the activities of farmers' cooperative business organizations operative during the period.

Membership, financial, and operating status of cooperative country elevators in Kansas, 1931–1934, R. M. GREEN (*Farm Credit Admin.* [*U. S.*], *Coop. Div., Misc. Rpt. 7* (*1936*), *pp. 32, pls. 2*).—This study was made jointly by the cooperative division of the Farm Credit Administration and the department of agricultural economics and the agricultural extension service of the Kansas State College. Information was compiled from 380 records, each representing the business of a farmers' cooperative grain elevator for one of the crop years,

1931–34. Altogether, records were obtained from 133 cooperative elevator associations.

Results of the regulation of cotton gins as public utilities in Oklahoma, R. A. BALLINGER (*Oklahoma Sta. Bul. 230 (1936), pp. 16*).—The provisions of the State legislation regulating cotton gins as public utilities and the characteristics of gins as public utilities are discussed. Data are presented as to ginning rates in eastern and western Oklahoma and adjacent areas in Arkansas and Texas, and as to rates for ginning picked and snapped cotton in Oklahoma. The effects of rate regulation on prices paid for cotton by ginners, quality of ginning furnished, growers' profits, etc., are discussed.

The author finds that the State regulation has resulted in higher rather than lower ginning rates, that the practice by ginners of buying cotton at prices so high that money has been lost on the purchases has been encouraged, that ginning in the State is not conducted under conditions of monopoly comparable to other industries regulated as public utilities, and that the lack of monopoly conditions is the most important reason for many of the difficulties encountered in regulating gins and the comparatively little benefit received by farmers from such regulation.

Truck transportation of fruits and vegetables in western Maryland, R. RUSSELL (*Md. Agr. Soc., Farm Bur. Fed., Rpt., 20 (1935), pp. 270–284*).—Data for the year ended June 30, 1934, were gathered from 189 fruit and vegetable growers in three areas of Maryland west of Chesapeake Bay. Tables show for each of the areas the tonnage, value, and cost of marketing for different crops and the types of transportation used in marketing. Other tables show the average time spent per trip in marketing truck shipments in the markets used, the average yearly costs of operating trucks, and the costs per ton-mile grouped according to the size of the load hauled, average hauled in miles, and total miles traveled during the year.

Fruits and vegetables received in trucks in the Columbus wholesale market, 1929–1935, C. W. HAUCK (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 86 (1936), pp. [2]+23, figs. 7*).—This is the eighth report of the series previously noted (E. S. R., 74, p. 718). The data gathered in 1935 are analyzed and comparisons are made with the years 1929–34, inclusive.

Roadside markets in Delaware, H. S. GABRIEL (*Delaware Sta. Bul. 201 (1936), pp. 25, figs. 3*).—In gathering the information as to practices of roadside markets, consumers' patronage of such markets, and the value of special types of packages, the following methods were used:

"Twenty-four of these roadside markets were visited and each proprietor was asked a number of similar questions. The answers to these questions gave a picture of just what the stands were doing. In order to get the consumer point of view 1,000 questionnaires were sent out, of which 279 were returned filled out in such a manner that answers could be used. For the package study, 200 special corrugated cardboard baskets were supplied by a large box company. These were used in the sale of apples, peaches, grapes, and tomatoes to test the consumer reaction to attractive packaging at a slightly increased cost."

The data obtained are presented in tables showing (1) for the markets, size of business, distance to nearest village, age of stands, products sold, sources of products, prices charged, methods of preparing products for market, attracting customers and advertising, number of men employed, etc., and (2) for the customers, the use made of markets and the reasons for patronizing or not patronizing the markets. The results of special package tests are briefly discussed.

Public produce markets of Michigan, O. ULREY (*Michigan Sta. Spec. Bul. 268 (1936), pp. 87, figs. 14*).—In this study the development and types of public

markets in the State are described. Analysis is made of the value and volume of produce sold; sales on public markets in relation to farm income; sales per capita of the market city; sales by groups of sellers, of home-grown and shipped-in produce, by groups of commodities, and in groups of buyers; seasonal distribution of sales; the use of public markets by farmers, including cost of selling, value of loads and annual sales, number and composition of loads, acreage and production, etc; the use of markets by truckers, dealers, retailers, hucksters, wholesalers, and consumers; and the operation and administration of public markets, including market prices, grades and standards, days and hours of operation, finances and records, ownership, control and administration, and layouts and facilities. Recommendations are made as to existing markets and the possibilities for and operation of additional markets.

New data on United States flour production since 1899, by States and by sizes of mills, H. WORKING (*Wheat Studies, Food Res. Inst [Stanford Univ.], 12 (1936), No. 8, pp. [2]+273–312, figs. 7*).—Consumption of flour in the United States was about 0.9 of a barrel per capita during each year 1921–29, but it dropped sharply during the depression and declined further when the processing tax was imposed. By 1934 the average consumption per capita had declined to slightly over three-quarters of a barrel. Large mills, producing 100,000 bbl. or more annually, provided 40.2 percent of the total flour output in 1899 and 80 percent in 1929. Their proportion declined slightly during the depression and was still only 79.9 percent in 1935.

Trends in the hog and pork trade in the United States, I. W. ARTHUR (*Iowa Sta. Bul. 346 (1936), pp. 239–278, figs. 7*).—Tables and charts are presented and discussed, the data being obtained chiefly from reports of the U. S. Department of Agriculture and from 143 packing plants showing for 1928 the number of hogs of different weights and grades slaughtered, the seasonal variation in numbers slaughtered, the nature of products sold, and the sources of supply.

A marked difference was found in the average weights of hogs received at the large central markets and in the average weights of hogs purchased and killed by packing plants in the different regions and in the same region. Areas with heavy corn production and proportionately few fall pigs tend to market the heaviest hogs. Pork packing, hog production, and corn acreage are increasing in the northwestern part of the United States and especially in the northwest Corn Belt. From 1915 to 1932 the central livestock markets located west of Chicago reshipped an increasing percentage of the receipts of slaughter hogs. Markets east of Chicago reshipped a declining percentage. From 1915 to 1926 the reshipments from Chicago increased. From 1926 to 1933 the trend at Chicago was reversed.

Europe as a market for American pecans (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Agr. Serv., 1936, F. S. 66, pp. [2]+25*).—Analysis is made of the European trend of production, supply, and consumption, and prices of competitive nuts, with a view to determinng the position of pecans in the markets of Europe and the European capacity to consume pecans.

Crops and Markets, [July 1936] (*U. S. Dept. Agr., Crops and Markets, 13 (1936), No. 7, pp. 217–256, figs. 3*).—Included are tables, reports, summaries, charts, etc., of the usual forms covering crop and livestock estimates, market reports, and the price situation.

RURAL SOCIOLOGY

The back-to-the-land movement in southern Indiana, H. E. MOORE and O. G. LLOYD (*Indiana Sta. Bul. 409 (1936), pp. 28, figs. 22*).—"This study was made to determine (1) the extent of the movement of population into some

of the poorer townships and into some of the better townships located in the same problem area of the State, (2) the characteristics of the newcomers, (3) the land tenure, kind of farming, poor relief and economic status of the newcomers in townships presumed to be submarginal and in nearby townships presumed to offer opportunities for great self-sufficiency, and (4) the effect, if any, of the back-to-the-land movement on local governmental costs."

Of the 608 families that moved back to the land between January 1, 1930, and June 1, 1934, 374 representative families were interviewed. Of these, 96 became full-time and 21 part-time farmer owners, 93 full-time and 19 part-time farmer renters, 21 farm hands, and 124 nonfarming rural residents. One hundred and fifteen settled in 9 better and 259 in 10 poorer agricultural townships. Tables and charts show for all townships, the better townships, and the poorer townships the findings as to amounts and sources of income, value of products of different kinds produced for sale and for home use, purchase price and indebtedness on owner-operated farms, livestock owned, land utilization, taxes, relief payments, school enrollments, etc.

Approximately 80 percent of the newcomers interviewed had either operated a farm, worked as a farm hand, or had been reared on a farm. Nearly 60 percent considered their residence permanent. The gross income per family averaged $479 in the better and $220 in the poorer townships. Of the gross income $332 was contributed by the farm in the better and $125 in the poorer townships. A higher percentage of the newcomers were full-time and part-time farmers in the better townships than in the poorer townships. Part-time farmers in all townships made larger incomes than full-time farmers. Fifty-six percent more livestock was kept on the farms in the better townships than on those in the poorer townships. The farms in the better townships averaged 30.6 crop acres as compared with 9.3 acres in the poorer townships. In the poorer townships 26 percent of the newcomers were on relief and received 18 percent of the relief paid, as compared with 6 and one-third of 1 percent, respectively, in the better townships.

Changes in population of counties in Michigan since 1930, J. P. THADEN (*Michigan Sta. Quart. Bul., 18 (1936), No. 4, pp. 242–245*).—The author presents an analysis of shifts in the population of the State, as indicated in the Federal Census of April 1, 1930.

Immigrants and their children in South Dakota, J. P. JOHANSEN (*South Dakota Sta. Bul. 302 (1936), pp. 47, figs. 8*).—Present trends indicate that the movement of immigration into the State has completed its course. The foreign born settled largely during the period 1870–90, and when South Dakota became a State in 1889 it had more than 90,000 foreign-born inhabitants. When the western part of the State was opened to settlement from 1900 to 1910 considerable additions were made to the foreign-born population of the State. At present there is greater emigration than immigration.

Immigration introduces a population element which has an abnormal age and sex distribution. The second generation, the native of foreign or mixed parentage, goes through a similar cycle as the parent group. At first it grows rapidly, then it becomes stabilized, and then it declines as a population element. It has repeated the age distribution pattern of the parent group and will do so further to the extent that immigration ceases. The aging of the population is inherent in the cyclical nature of the immigration movement. Its sudden influx, combined with its recent sudden stoppage, tends to produce certain cyclical phenomena in the population statistics of the State. As the immigrant generation grows older, the related second generation will do likewise, but the native of native parentage has shown a relatively stable age distribution since 1900.

Three conditions affect the size of the families: Nativity, foreign and native; residence in rural-farm, village, and urban territory; and the year of immigration. Large families are found in those immigrant groups which have come to the United States relatively recently, while small families are more numerous in the immigrant nationalities which came relatively early. The foreign born in the State have settled in rural territory in somewhat greater proportions than have the natives. Their farm life, their traditions of family life, the status of women among them, their religious faiths, and their whole life outlook have all been favorable to a prolific family life. In urban communities in the State there is a much smaller proportion of children to women, native as well as foreign born, than in rural farm areas. Several facts and trends point toward a stable or decreasing population in the State in the near future.

Mobility of rural relief families in Tennessee, C. E. ALLRED, B. H. LUEBKE, and C. A. TOSCH (*[Nashville]: Tenn. Works Prog. Admin., 1936, Rpt. 14, pp. II+35, figs. 19*).—Seventy-three percent of the 2,236 relief families in nine representative counties of Tennessee have resided in the county since birth; 16 percent have moved into the county since 1930, the largest percentage during 1933. Fifty-eight percent of the heads of relief households live in the open country, 36.5 percent reside in villages, and 5.5 percent in towns. Of all occupational groups, farm owners have resided the greatest number of years in the county and farm laborers and croppers the least number. One-third of the heads of relief households are unemployed and seeking work. Fourteen percent of those have moved into the county during the last 5 yr. Thirteen percent of 6,549 relief cases in six representative counties had members returning from nonfarming occupation elsewhere. The return movement from points in Tennessee has been principally from places within the county or from adjoining counties.

[Rural relief and rehabilitation possibilities in Houston, Overton, Henderson, Jefferson, and Williamson Counties, Tennessee], C. E. ALLRED ET AL. (*[Nashville]: Tenn. Welfare Comm., 1935, Rpt. 3, pp. IV+45, figs. 26; 1936, Rpts., 4, pp. IV+33, figs. 19; 7, pp. IV+55, figs. 26; 10, pp. IV+47, figs. 26; Tenn. Works Prog. Admin., 1936, Rpt. 13, pp. IV+48, figs. 26*).—The Tennessee Experiment Station cooperated in these reports.

The families on relief in May 1935 in Houston County had 44.9 percent of dependents under 16 as compared with 39.1 percent for the general population in 1930. Of the families in the county in 1930, 63.8 percent of the colored families and 56.6 percent of the white families have been on relief. During May 1935, 29.6 percent of all the families were on relief. Net resources of 92.4 percent of all relief families are less than $500 each. Fifty-seven percent of all relief clients own or rent some land, but only 42.9 percent have holdings as large as 3 acres or more and only 30.4 percent give farming as their usual occupation. Farm relief families as well as nonfarm relief families are deficient in cows, hogs, poultry, gardens, and cans for preserving foods. Of the 365 families now on relief 48 percent have no livestock whatever; only 66.6 percent have gardens, although garden land is available to more than 90 percent of them; 47 percent have canned fruits and vegetables; 3 percent have automobiles; and 29.2 percent own their own homes.

Approximately 48 percent of the relief clients in Overton County are dependents under 16 yr. of age. Of the 30 negro families in 1930, only 9 have been on relief. Among white families 55.6 percent have been on relief and 23 percent were still on relief in January 1935. The debt of all relief families amounts to 54.5 percent of the total value of their property. In the farm tenant group the indebtedness is equal to as much as 117.5 percent of the total value of their property and in the farm labor group the percentage is 224.4.

The average size farm for relief families reported as operating farms (25.9 acres) is small in comparison with all farms of the county (62.4 acres). The average size farm of the open case families (18 acres) is much smaller than the average size farm of the closed case families (31.4 acres). Farm families on relief as well as nonfarm relief families are deficient in cows, hogs, poultry, gardens, and cans for preserving foods. Twenty percent of the open cases do not possess livestock of any kind. Of the families now on relief (open cases) only 58 percent have gardens, yet garden land is available to 93 percent of them. Approximately 50 percent of these cases do not have canned fruits or vegetables, and only 0.7 percent of them own automobiles. In June 1935 the rate of relief in the county was 32.4 percent, or over 2.5 times as high as the State average of 12.5 percent.

The families on relief in May 1935 in Henderson County had 10.3 percent heavier burden of dependents under 16 than had the families of the general population in 1930 (48.6 compared with 38.3 percent). On the average there are 0.9 employable males per relief family compared with 1.3 actually employed in the general population in 1930. Of the 380 colored families in the county in 1930, 77 of them, or 20.3 percent, have been on relief and 6.1 percent are still on relief. Among white families 17.7 percent have been on relief and 8.3 percent are still on relief. Net resources of 97.9 percent of all relief families average less than $500. The debt of all relief families is equivalent to 85.2 percent of the total value of their property, and in the farm tenant group the indebtedness is equal to as much as 102.2 percent. Only 40 percent of all relief clients, compared with 82.1 percent for all families of the county, own or rent some land. Farm relief families as well as nonfarm relief families are deficient in cows, hogs, poultry, gardens, and cans for preserving foods.

The families on relief in April 1935 in Jefferson County had 6.3 percent heavier burden of dependents under 16 than had the families of the general population in 1930 (44.2 compared with 37.9 percent). Of the 272 colored families in the county in 1930, 141, or 51.8 percent, have been on relief and 35.3 percent are still on relief. Among white families 26 percent have been on relief and 15.3 percent are still on relief. Net resources of 93.7 percent of the relief families average less than $500. The debt of relief families is equivalent to 56.7 percent of the total value of their property, and in the farm tenant group the indebtedness is equal to as much as 66.6 percent. Forty-nine percent of all relief clients, compared with 58 percent for all families in the county, own or rent some land. The average crop acreage of 28 farm cases that were closed on account of improved farming opportunity is 3.2 acres larger than the average for all cases but is 13 acres smaller than the county average of 27.1 acres. Practically all of the relief farmers have some livestock, but 25.7 percent of the open case farmers have no dairy cows, 38.6 percent have no hogs, and 15.2 percent have no poultry. Of the 643 families now on relief, 73.3 percent have some livestock, 85.8 have gardens, 78.8 have canned fruits and vegetables, and 7.3 percent have automobiles.

In April 1935, 9 percent of all the families in Williamson County were on relief. Work relief is the most important type of relief, over 50 percent of the families receiving this type. Nonfarm families received the highest average benefits. Approximately 36 percent of all persons on relief are employable and all but 44 relief families had at least one employable member. Twelve percent of the heads of relief families are female and over 63 percent of these have families to support. Net resources of over 95 percent of relief families average less than $500. Indebtedness of relief families, in percentage of all property, is over 50 percent. Only 21.6 percent of the relief families own or rent land and over 86 percent of their cropland was in corn, indicating a lack of crop

diversification. Families in the low relief districts of the county average more livestock units per farm and have greater crop diversification than do families in districts having a high relief rate.

Grundy County, Tennessee: Relief in a coal mining community, C. E. ALLRED, C. A. TOSCH, M. T. MATTHEWS, G. A. BAKER, W. E. COLLINS, P. H. SANDERS, and B. D. RASKOPF ([*Nashville*]: *Tenn. Welfare Comm., 1936, Rpt. 11, pp. V+51, figs. 15*).—According to this report in which the Tennessee Experiment Station cooperated, in January 1935 60 percent of the total population of Grundy County was on relief. Net resources of 94.2 percent of the relief families averaged less than $500. Total indebtedness of relief families, in percentage of all property, was over 50 percent. Fifty-six percent of relief farmers had no dairy cows, 43 percent no hogs, and 37 percent no poultry. Farmers of the general population average more than twice as much livestock as relief farmers, the averages per farm being 6.6 and 3.1 livestock units, respectively. Sixty-one percent of the families receiving relief were of the nonfarm group, most of whom were miners.

Public library service in South Dakota, W. F. KUMLIEN (*South Dakota Sta. Bul. 301 (1936), pp. 32, figs. 12*).—This study, made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., covered the 74 public libraries of the State, most of which are located in cities, towns, and villages.

The majority of rural people in the State are without local public library service. In 62 out of 66 counties the only public libraries are those supported independently by the towns and villages. In these same 62 counties 92.2 percent of the borrowers are town people, while 7.8 percent are farmers. The former spend 43.1 ct. per capita for library service and the latter 4.8 ct.

In the four counties with county libraries, both town and country people share alike in the expense, management, and the service. The farm people respond quickly to library opportunity, there being a larger number of country borrowers than among those living in towns.

Although there are 70 independent town and village libraries in the State, the unit of their support in all but 26 cases is less than 1,500 people. When the supporting area is so small, either the cost per capita has to be excessive or else the quality of service suffers.

The solution of the problem for both town and country under South Dakota conditions seems to be the county library. There are probably 40 counties in the State where a county library system would serve both the town and country districts better than they are now being served and at not to exceed an average cost of from 50 ct. to $1.00 per capita per year.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

A possible intermediate step in the reorganization of rural elementary education in Iowa, B. MORGAN and W. H. LANCELOT (*Iowa Sta. Res. Bul. 200 (1936), pp. 279–330, figs. 4*).—The investigation reported in this bulletin, relating to the school year 1932–33, included 30 representative counties in the State. Its purpose was to ascertain the relative number of the rural children who might have, without any significant change in the cost of their education, attended existing graded schools instead.

The proposed reorganizations were planned on community bases. Each community included an existing town or consolidated school as a center and the nearby rural schools as tributaries. In the 30 counties studied it was found that the schools of 191 communities could be reorganized without increasing the cost in any community, the average saving being a little over 6 percent. If the proposed reorganizations were allowed to increase the cost as much as 8 percent

in certain communities, the schools of 227 communities could be reorganized at an average saving of about 5 percent.

The number of pupils enrolled per teacher ranged from 13 to 47 in the existing graded elementary schools. The median was 26.5. In the ungraded rural schools the enrollment per teacher ranged from 3 to 51 with a median of 15.1. In the reorganized systems, as planned, the range would have been from 25 to 35 with a median of 31.5. "It is apparent that a majority of the ungraded rural schools have enrollments too small to operate economically."

No alterations would have been necessary in the school plants of 159 of the 227 existing graded school systems which would have been attended by the rural children. The cost of necessary alterations in the plants of the remaining 68 was estimated to range from $180 to $20,000, to average $3,125, and in but three instances to exceed $10,000.

It is thought that the reorganization of rural elementary education in any community as described in this bulletin would probably increase somewhat the high school attendance of farm children.

Vegetable exhibitions: Their planning and management, L. E. SOMERS (*Illinois Sta. Circ. 455 (1936), pp. 28*).—Information on planning and arranging an exhibition and the scope and arrangement of home-garden exhibitions and commercial vegetable displays and suggestions for exhibitors choosing specimens for exhibit and preparing and arranging them and for judges as to standards, scoring, etc., are included.

Directory of activities of the Bureau of Plant Industry (*U. S. Dept. Agr., Misc. Pub. 238 (1936), pp. 130, figs. 2*).—The activities of the several divisions of the bureau are described. The field stations are listed by States with a statement of the lines of investigations carried on. An organization chart of the bureau and a map showing the location and character of the field stations are included.

Practical problems in botany, W. W. ROBBINS and J. ISENBARGER (*New York: John Wiley & Sons; London: Chapman & Hall, 1936, pp. IX+402, figs. 230*).—This text is organized on the basis of a series of problems on organization and composition of plants, nutrition of green and nongreen plants, growth, reproduction, dependence of plants on the conditions of their surroundings and how plants are fitted to these conditions, development and improvement of plants, classification, and economic importance to man.

Marketing principles: Organization and policies, J. F. PYLE (*New York and London: McGraw-Hill Book Co., 1936, rev. ed., pp. VIII+783, [pl. 1, figs. 28]*).—This is a revised edition of the textbook previously noted (E. S. R., 65, p. 683). The material is presented in chapters on some significant aspects of marketing; market potentials; buying motives, customs, and practices; marketing functions; the elements of a marketing organization—wholesale middlemen, retail functionaries, and chain stores; marketing methods; the marketing of agricultural, natural, and manufactured products and of services; some marketing problems connected with prices; financing marketing activities; some problems of risk in marketing; sales-promotional activities; problems of agricultural cooperative marketing; some aspects of formal social control in marketing; the place of executive control in marketing: and standards of marketing accomplishment.

George Washington and agriculture: A classified list of annotated references with an introductory note, E. E. EDWARDS (*U. S. Dept. Agr., Library, Bibliog. Contrib. 22 (1936), 2 ed., pp. V+77*).—The bibliography previously noted (E. S. R., 66, p. 191) has been enlarged to include 311 references.

FOODS—HUMAN NUTRITION

The nutritive value of animal tissues in growth, reproduction, and lactation.—III, The nutritive value of beef heart, kidney, round, and liver after heating and after alcohol extraction, W. H. SEEGERS and H. A. MATTILL (*Jour. Nutr., 10 (1935), No. 3, pp. 271–288, figs. 5*).—The investigation noted previously (E. S. R., 72, p. 722) was extended to similar studies of the alcohol-extracted material of beef heart, round, and kidney and a more detailed study of the liver.

There was little difference in the growth rate of rats fed the various materials at a 15-percent protein level in an otherwise apparently complete ration. After extraction with hot 95 percent alcohol in a continuous extractor for 60 hr., all of the materials promoted growth at a less rapid rate, particularly the extracted liver. Studies of the biological values of the proteins of the liver after various treatments showed that the alcohol extraction altered the protein to such an extent as to make it only slightly digestible. In vitro digestion experiments with all of the alcohol-extracted materials confirmed the low digestibility of the liver proteins after extraction. The other materials showed no appreciable loss in digestibility, leading the authors to conclude that, with the exception of liver, the difference between the extracted and unextracted meats can be ascribed solely to the removal of nutrients not adequately supplied by the yeast and cod-liver oil supplement.

The digestibility and biological value of the proteins of the liver were not lowered appreciably by heating at 100° C. for 2 weeks. At temperatures above 100° there was a progressive lowering of digestibility with increase and prolongation of the heat. The heart and kidney were not changed at 120° and the kidney not to any great extent at 130°. At higher temperatures these meats also resisted digestion both in vivo and in vitro. "These changes in digestibility probably play no role in the domestic cooking of meats, but are of importance in the preparation of pure proteins for nutrition studies."

The relationship of the distribution of body fat to the cooking losses with graded dressed poultry, W. A. MAW, R. HOLCOMB, E. E. RODGER, and A. M. FRANKLIN (*U. S. Egg and Poultry Mag., 42 (1936), No. 5, pp. 276–278, 314, 315*).—Roasters were graded according to the definitions of the Canadian market grades, A, B, and C, based on conditions of fleshing and fat distribution of dressed poultry.

Analyses made on the graded carcass showed that the A grade had a significantly higher percentage of total edible parts and less total waste than either B or C grade stock. The percentage of fat in the edible portion was found to be 21.9 percent for grade A, 14.7 for grade B, and 8.3 percent for grade C.

The results of analyses of roasters cooked according to the described method were found to follow closely those obtained on the uncooked carcass for percentage of total edible parts and waste. The percentage of fat lost was higher for A and B grades than for C, but the percentage of moisture lost was less for the higher grades, resulting in a drier meat for grade C.

Hydrogenated lard as a culinary fat (*Indiana Sta. Rpt. 1935, p. 44*).—This progress report summarizes the results obtained in a comparison of the flavor and shortening value of open-kettle rendered lard prepared from the leaf fat and fat back of each of 20 hogs fed a known soybean-corn-mineral ration and of hydrogenated lard from the same sources.

Biochemistry of bread making, C. H. BAILEY and R. C. SHERWOOD (*Indus. and Engin. Chem., 27 (1935), No. 12, pp. 1426–1430, figs. 5*).—This is a discussion, with numerous references to the literature, of the chemistry of wheat flour and other dough constituents, the colloidal chemistry of dough solution, the chemical

and physical changes in the fermentation of the dough mixture, and the process of saccharogenesis.

"Bread making is a dynamic process in which various organisms and tissues and numerous enzymes are involved. Flour from normal wheat contributes starch, sucrose, a trace of glucose, and the saccharifying enzyme β-amylase. Flour milled from germinated wheat or active malt extracts contributes α-amylase, the starch-liquefying enzyme. In doughs or flour suspensions to which small amounts of wheat or barley malt have been added, the rate of saccharification is greatly increased. The effect on sugar production is substantial and prompt. A decided increase in reducing sugar content was registered during the dough-mixing operation of only a few minutes' duration, and over 70 percent of the total reducing sugar produced during 1 hr. of autolysis of a yeast-free suspension was formed during the first 15 min.

"An acceleration of carbon dioxide production or 'gassing power' results when yeast is present, and rates of saccharification may be held at a fairly constant level during normal dough fermentation of about 5 hr., since the fermentable reducing sugar, chiefly maltose, is converted into alcohol and carbon dioxide about as rapidly as formed."

The influence of various factors, including altitude, on the production of angel food cake, M. A. BARMORE (*Cereal Chem., 13 (1936), No. 1, pp. 71–78, figs. 7; abs. in Jour. Colo.-Wyo. Acad. Sci., 2 (1935), No. 1, p. 19*).—Essentially noted from Colorado Station Technical Bulletin 15 (E. S. R., 75, p. 278).

The available carbohydrate of fruits.—Determination of glucose, fructose, sucrose, and starch, E. M. WIDDOWSON and R. A. MCCANCE (*Biochem. Jour., 29 (1935), No. 1, pp. 151–156*).—Determinations of available carbohydrate were carried out on the edible portions of 41 varieties of fresh fruits, and the results are reported in tabular form. The reducing sugars were determined in an alcoholic extract by the copper titration method. The glucose/fructose ratio was calculated from values obtained by the iodimetric procedure and estimates by Fehling's solution. Starch was determined in the residue from the alcoholic extraction by the takadiastase method. The sum of all the sugars was taken to represent the available carbohydrate.

Starch was present to the extent of 3 percent in the banana and in less amounts in the apple, pear, and tomato. Most of the fruits had approximately equal amounts of glucose and fructose. A few fruits contained no sucrose.

Citrus fruits in nutrition, O. D. ABBOTT (*Fla. State Hort. Soc. Proc., 48 (1935), pp. 61–64*).—In this contribution from the Florida Experiment Station, the author discusses the qualities which make citrus fruits valuable in the diet.

Investigations on fig preservation, S. KALOYEREAS (*Fruit Prod. Jour. and Amer. Vinegar Indus., 15 (1936). No. 8, pp. 240–243, figs. 4*).—The main purpose of the investigation was to improve the method of conserving fresh figs for a longer period of time. Fresh figs packed in layers separated by fig tree leaves have been successfully shipped as far as Germany. The use of hydrogen peroxide was found to be a satisfactory sterilizing treatment for the fresh fruit.

The experiments on dried fruit resulted in a practical method of sterilizing the fruit by using a mixture of CO_2 and CS_2 in special concrete sterilizing chambers.

Analyses showing the percentage of food constituents are given for several varieties of dried and fresh figs grown in different regions of Greece.

Byproducts of figs, particularly marmalade made from dried figs, were manufactured on a commercial scale as a result of investigations on preservation.

Some fruits of Hawaii: Their composition, nutritive value, and use, C. D. MILLER, K. BAZORE, and R. C. ROBBINS (*Hawaii Sta. Bul. 77 (1936), pp. 133, figs. 16*).—This bulletin has been prepared to supply information on the following widely used Hawaiian fruits: Avocado, banana (*Musa sapientum*), breadfruit, carambola (*Averrhoa carambola*), coconut, coffee (*Coffea arabica*), fig (*Ficus carica*), Isabella grape (*Vitus labrusca*), common guava (*Psidium guajava*), strawberry guava (*P. cattleyanum*), lemon, lime, litchi, mango, mountain or Malayapple (*Eugenia malaccensis*), Hawaiian orange (*Citrus sinensis*), papaya, passion fruit (*Passiflora edulis*), pineapple, poha (*Physalis peruviana*), soursop (*Annona muricata*), strawberry (*Fragaria chiloensis*), Surinam-cherry (Pitanga) (*E. uniflora*), tamarind, and watermelon.

For each of these fruits the general information given includes description—in some cases with photograph, history, special nutritive value, supply, and selected recipes. The sources of information on the nutritive value include many original data obtained by the authors, as well as some from the literature. Tabulated data are given on the proximate composition and total ash, calcium, phosphorus, and iron content of all of the fruits listed above except lime and lemon. Other tabulated data include the average weight and percentage of refuse of the various fruits, with description of the portions of the fruit considered as refuse; average measure and cost per pound as purchased and as edible portion; weight, measure, and cost of 100 calorie portions, and distribution of calories per 100 g and per pound of edible portion; the quantity of juice obtained from 1 lb. of the juice fruits as purchased; and qualitative values for vitamins A, B, C, and G for most of the fruits and quantitative values for a small number.

In a technical section of the bulletin, descriptions are given of the preparation of the fruit for chemical analysis and the analytical methods employed, including the technic for vitamin determinations.

Data on which the vitamin unit values were based are given for vitamins A and G in figs, guavas, papaya, pineapple, and pohas; vitamin B in the same fruits and also in soursop and tamarind, and vitamin C in all these fruits and also in coconut water, orange juice, and passion fruit juice.

A list of 75 references to the literature is appended.

[Strawberry sirup], G. A. SHUEY (*Tennessee Sta. Rpt. 1934, p. 21*).—This progress report describes briefly a method which has been developed for making a semi-sirup from strawberries suitable for use on ice cream, for blending in fruit punches, and for other flavoring purposes.

The mineral content of sirups, molasses, and soft sugars, O. SHEETS and R. W. PEARSON (*Mississippi Sta. Tech. Bul. 22 (1936), pp. 12*).—Published data on the content of ash and mineral constituents (iron, copper, calcium, and phosphorus) of sirups and molasses are summarized, and new data obtained by the authors, with the technical assistance of S. D. Sumerford and J. F. Weeks, are reported for samples of sorghum and sugarcane sirups made according to the usual farm methods and obtained from different localities throughout the State and for a large number of commercial sirups, molasses, and sugars. The data for the farm-manufactured products are tabulated as sorghum sirup evaporated on iron pans, sorghum sirup evaporated on copper and noniron pans, sugarcane sirup evaporated on iron pans, and sugarcane sirup evaporated on copper pans. In most cases the variety of sorghum or sugarcane used is given. Accompanying the data on commercial products are the name of the product and the description on the label.

The data show great variation in the mineral content of the sirups, molasses, and sugars. In general terms sorghum sirup has a high iron and copper content. Sugarcane sirup, especially when evaporated on an iron pan (E. S. R.,

73, p. 563) may be an excellent source of iron. Both sorghum and sugarcane sirups contain fair amounts of copper and phosphorus. "The blends of corn and refiners' sirup may be good sources of iron and copper, depending upon the quantity and quality of the refiners' sirup used. Molasses has a high mineral content, but unfortunately palatability decreases as its mineral content increases. . . . Brown sugar . . . may contain appreciable quantities of minerals, especially iron and copper. The lighter sugars have a low mineral content, but not as low as that of some of the sirups."

Wine in the diet, W. V. CRUESS (*Fruit Prod. Jour. and Amer. Vinegar Indus., 15 (1936), No. 9, pp. 260, 261, fig. 1*).—This paper from the California Experiment Station is a general discussion on the use and dietary values of wine.

Food fallacies and nutritional quackery, D. B. JONES ET AL. (*Amer. Pub. Health Assoc. Yearbook, 1935–36, pp. 58–63*).—In this report of the Committee on Nutritional Problems, evidence is given, with literature citations, refuting certain nutritional fads and fallacies such as the theory that proteins and starches are incompatible and should not be served together, incorrect use of the term acidosis and false claims concerning its cause, various diet systems for treatment of arthritis and hypertension, and false claims as to the relative digestibility of various foods. Other food fallacies are listed as "so fanciful and absurd that to the person of ordinary intelligence they need no refutation."

A long term experiment with rats on a human dietary, J. B. ORR, W. THOMSON, and R. C. GARRY (*Jour. Hyg. [London], 35 (1935), No. 4, pp. 476–497, pl. 1, figs. 7*).—This study differs in certain respects from previous attempts to assess the value of human dietaries by feeding experiments on rats. The diet used approximated closely the average diet of a working class community in Scotland as ascertained in an earlier dietary survey, and was given in daily variations to approximate more closely the food habits of human beings. At the beginning of the experiment 60 rats from 30 to 40 days old were arranged in two groups of 20 females and 10 males each. One group was given the diet as planned and the other the same diet supplemented with a definite amount of green vegetables and milk ad libitum. Breeding difficulties on the unsupplemented diet necessitated doubling the limited amount of milk in the original diet. With this change only, the experiment was continued for 2½ yr., a period covering 4–5 generations of rats and corresponding to 100 yr. or more of human life.

The rats on the diet supplemented with green vegetables and milk were healthy in every respect, while those without additional milk and green food showed "(1) a slightly impaired reproductive capacity, (2) a very markedly increased death rate due to increased susceptibility to an infection to which all rats were equally exposed, (3) a definitely slower rate of growth, (4) a lower hemoglobin content in the blood, and (5) a clinically poorer condition as judged by behavior and state of the coat." The authors conclude that if these results are applicable, "even to some extent, to human beings, they suggest that a large section of the human population is still far from the optimum state of nutrition, and that much could still be done by means of improved food supply to raise the resistance to infection and to improve the physique of human beings."

The comparative rate of absorption of various fats, H. STEENBOCK, M. H. IRWIN, and J. WEBER (*Jour. Biol. Chem., 114 (1936), No. 1, pp. C, CI*).—In this study at the Wisconsin Experiment Station, rats were fasted 48 hr., then were given 1.5 cc of melted fat of different kinds by stomach tube, and after absorption periods of 2, 4, 6, 8, and 12 hr. were sacrificed to analyze the intestinal residues for the amount of fat. The percentage absorption after a 4-hr. period for two partially hydrogenated vegetable oils was 52.8 and 53.8 percent, respec-

tively, for lard 57 percent, for corn oil 58.3, for butter oil 71, for halibut-liver oil 70.2, and for cod-liver oil 67.7 percent.

Inorganic salts in nutrition.—Changes in kidneys of rats fed a diet poor in inorganic constituents, P. P. SWANSON, C. A. STORVICK, and A. H. SMITH (*Jour. Biol. Chem., 114 (1936), No. 1, pp. 309-319*).—In continuation of previous studies (E. S. R., 73, p. 874) at the Iowa Experiment Station, 70 rats 37 days old were fed purified diets extremely low in inorganic constituents to show the effect on the excretory system. At the beginning of the experiment one group was anesthetized, another group after 21 days of experimental feeding, and two other groups after 42 and 63 days, respectively. At the same intervals, groups were removed from 69 rats which had been fed the low salt diet fortified with an adequate salt mixture. A second control group was given the adequate diet until the body weight equaled that of the experimental group at the end of 90 days and then these were sacrificed. The kidneys were extirpated and weighed, dried to constant weight, and analyzed for ash, calcium, and phosphorus.

The results showed that after 21 days of low salt intake the kidney had enlarged to the extent that the increment was twice normal. This weight was maintained for approximately 45 days. A regression due to the loss of total solids followed so that at the end of 90 days it was only 32 percent larger than at the beginning. For the same experimental period normal kidneys had increased 94 percent in weight, due to an increase in total solids. At the end of the period the kidneys of the rats on the low salt diets in relation to normal kidneys were definitely hydrated, showed a high proportion of ash, a high percentage of calcium, an increase in phosphorus, and no decrease in the proportions of ash, calcium, and phosphorus with advancing age. These results are discussed with reference to previous metabolic findings (E. S. R., 75, p. 724).

Effects of increasing the calcium of a diet in which calcium is one of the limiting factors, H. C. SHERMAN and H. L. CAMPBELL (*Jour. Nutr., 10 (1935), No. 4, pp. 363-371, figs. 2*).—As a part of an investigation to explain the superiority of the authors' diet B over diet A (E. S. R., 60, p. 787), the effect of the addition to diet A of an amount of calcium carbonate sufficient to increase the calcium content of the dry food mixture from 0.2 to 0.35 percent (representing the calcium content of diet B) was studied with rats throughout the natural life cycle and through successive generations.

The enrichment of the diet was followed by a more efficient utilization of food as calculated on the basis of energy value or protein content, better growth, earlier maturity, higher adult vitality as demonstrated particularly by the breeding records of the females, a longer period between the attainment of maturity and onset of senility, and, in less degree, in the average length of life. This increase was more significant for the males than the females. As the females had raised more young than the corresponding animals on diet A, it is thought that the added drain of calcium reserves may have accounted for the fact that the increase in length of life for the females was not as significant as for the males.

The authors conclude that "the previously reported improvement of an already adequate food supply is in part (though not solely) attributable to the enrichment of the calcium intake, and that the level of calcium intake most conducive to optimal well-being is significantly higher than that required for normal growth and maintenance."

Calcium involvement in magnesium deficiency, E. V. TUFTS and D. M. GREENBERG (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 3, pp. 292-294*).—In

a preliminary report, further evidence is given in support of the hypothesis of McCollum et al. (E. S. R., 72, p. 876) that there exists a relationship between the metabolism of calcium and magnesium in the animal body.

Rats were fed on a high and a low calcium diet with magnesium at the same level for both diets. The animals fed the high calcium diet developed symptoms of magnesium deprivation, such as hyperemia, hyperirritability, and cachexia, a high percentage died from convulsions, and the remaining rats showed signs of malnutrition. The rats fed on low calcium diets remained in a normal state of health, and the females gave birth to normal young. Analyses of the heart, muscle, and kidney showed that the magnesium content was only slightly altered, while the calcium content of the heart and muscle was increased about 60 per cent over normal. The accumulation of calcium in the kidneys showed the mean for the control rats to be 22.2 mg of calcium per 100 g of wet kidney and that for the deficient rats to be 141 mg of calcium.

The calcium and phosphorus content of the body of the brook trout in relation to age, growth, and food, C. M. McCay, A. V. Tunison, M. Crowell, and H. Paul (*Jour. Biol. Chem., 114 (1936), No. 1, pp. 259–263*).—In a preliminary study at the [New York] Cornell Experiment Station, 3 groups of trout containing 50 individuals in each were isolated and all were fed a diet of beef liver. After 5 days, 25 trout from each group were preserved for analysis. The remaining trout were continued on the diet for 12 weeks. The calcium content was determined of the water, the beef liver, and the trout at the beginning and at the end of the experimental period. The results showed that the trout stored an average of 5.4, 6.2, and 5.9 mg of calcium for each of the 3 groups. One-fourth of this calcium originated in the food and three-fourths had been absorbed from the water.

In a second series the calcium and phosphorus were determined in 1-day-old eggs, at the "eyed" stage, in the "sac fry", in young trout before they were ready to eat the beef liver diet, and in the trout at intervals of 4 weeks for 10 mo. Calcium and phosphorus analyses were made of the fish, water, and liver. The results showed that in the egg sac stage the body calcium was markedly increased and that this calcium must have originated in the water. The phosphorus content was higher in the eggs and fry than the calcium, but after the fry started eating, the calcium content rapidly increased until it was nearly equal to the phosphorus content.

Calcium and phosphorus needs of preschool children, A. L. Daniels, M. K. Hutton, E. M. Knott, O. E. Wright, and M. Forman (*Jour. Nutr., 10 (1935), No. 4, pp. 373–388, figs. 4*).—The previously noted study of the calcium needs of children of preschool age (E. S. R., 71, p. 881) has been extended, with longer metabolism periods and slight modifications in the method of food preparation, as described in detail in the report on the protein needs of children of this age group (E. S. R., 74, p. 130). The children, who were between 36 and 66 mo. of age, were cared for as in the previous study, and the analytical methods were for the most part the same. As the calcium retentions were found to be similar to those in the earlier study, the results of both studies were grouped for analysis according to the calcium ingestion per kilogram of body weight at intervals of 5 between 35 and 100 mg, with corresponding phosphorus and nitrogen ingestion. Scatter diagrams were also prepared to show the relation of calcium ingestion to retention in the present study and in both series of the earlier study.

Wide variations in both calcium and phosphorus retentions were obtained at similar ingestion levels whether calculated in terms of weight or of height. High retentions were interpreted as being due to previous depletion. It is concluded that an intake of from 45 to 50 mg of calcium per kilogram of body

weight or from 7 to 9 mg per centimeter of height is sufficient for the age group studied, provided the calcium is available and sufficient vitamin D is allowed. The phosphorus needs of children in the same age group are estimated to be from 55 to 60 mg per kilogram, or from 9 to 10 mg per centimeter, depending on the presence of an adequate amount of vitamin D. Calcium retentions between 7 and 9 mg, and phosphorus retentions between 6 and 9 mg, per kilogram are considered to be normal for well-developed children.

Egg yolk and bran as sources of iron in the human dietary, E. McC. VAHLTEICH, E. H. FUNNELL, G. MACLEOD, and M. S. ROSE (*Jour. Amer. Dietet. Assoc., 11 (1935), No. 4, pp. 331–334*) —This is a continuation of the studies made on the availability of iron in egg yolk and bran (E. S. R., 71, p. 725).

The participants, two healthy young women, carried out two iron balance studies of 9 days each between menstrual periods. Each study was preceded by a day of low iron intake, followed during the periods of study by an average intake of 5.7 and 5.3 mg of iron, 3 mg of which was furnished by the egg yolk and bran.

Iron balances showed that the iron of egg yolk and of bran prepared by steaming and toasting are equally efficient in maintaining iron equilibrium in the human adult.

Tables are given showing daily food consumption and the iron balances in 3-day periods.

The iron requirement of the normal human adult, G. E. FARRAR, JR., and S. M. GOLDHAMER (*Jour. Nutr., 10 (1935), No. 3, pp. 241–254*).—The four subjects in this investigation included three young adult men and one woman who had been subsisting for periods of 316, 160, 110, and 41 days, respectively, on accurately measured constant simple diets in connection with another investigation. The iron content of their diets was determined at frequent intervals, and toward the end of the experiment the excretion of iron in the feces and urine and the iron, red blood cell, and hemoglobin content of the blood were also determined.

The average daily values for intake and outgo during the iron balance periods lasting 31, 5, 5, and 17 days, respectively, were intake 5.2 mg and iron content of feces 5.2 mg, 7.7 and 7.6, 7.3 and 7.2, and 8.3 and 8 mg, respectively. The average iron content of the urine was 0.2 mg for each of the subjects. Blood iron values were 56.3, 52.8, 54, and 47.8 mg per 100 cc and hemoglobin by the Sahli method, in which 16.6 g per 100 cc represents 100 percent, were 98, 94, 97, and 80 percent, respectively. The total menstrual blood loss in the single period included in the experimental period of the female subject was determined roughly as 33 cc.

In the diet of the subject remaining on experiment for 316 days, the available iron calculated by the Hill method amounted to only 3 mg when the total iron of the diet was 5 mg daily.

The authors conclude that the iron requirement of the normal adult male is not more than 5 mg daily.

Sexual differentiation in the storage of iron by the rat, H. STEENBOCK, J. SEMB, and E. C. VAN DONK (*Jour. Biol. Chem., 114 (1936), No. 1, p. CI*).—Iron analysis of the rat at the Wisconsin Experiment Station showed that the amount of iron in the young at birth depended upon the amount stored by the mother, that the females accumulated larger iron stores than the males, that during pregnancy these iron stores were rapidly depleted as the amount in the fetuses increased, that after parturition the depleted stores were rapidly increased to normal levels, and that the iron stores decreased after castration of the females. Injection of follicular hormone increased the iron in immature

females as compared to that of litter mate controls, indicating that the storage in the female was influenced by ovarian secretions.

Studies on aluminum.—II, The storage of intravenously injected aluminum in the dog, D. F. EVELETH and V. C. MYERS (*Jour. Biol. Chem., 113 (1936), No. 2, pp. 467–471*).—Using the aurin method described on page 743, the authors studied the storage of aluminum in the tissues of 4 dogs given 10 daily intravenous injections of 1 mg per kilogram of soluble aluminum. At 78, 125, 137, and 150 days, respectively, the dogs were killed and the tissues analyzed.

The results indicated that part of the injected aluminum was primarily stored in the liver and spleen, but also in the kidney; that part of it was promptly excreted in the bile and urine; and that the stored aluminum was retained in the tissues of the dog for a long time. One dog killed 53 min. after the injection of 1 mg of soluble aluminum showed an immediate distribution of aluminum in the tissues. The values obtained by Underhill and Peterman (E. S. R., 62, p. 585) were found to be too high.

Metabolism in the rat of the naturally occurring arsenic of shrimp as compared with arsenic trioxide, E. J. COULSON, R. E. REMINGTON, and K. M. LYNCH (*Jour. Nutr., 10 (1935), No. 3, pp. 255–270, fig. 1*).—Arsenic as present in shrimp was found to be far less available for storage in young rats than when fed at the same level as As_2O_3. During the first 3 mo. of the feeding period 18 percent of As_2O_3 incorporated in the diet at a 17.9-percent level was stored as against 0.7 percent for the same amount of arsenic in shrimp. The total quantity stored was not significantly increased by feeding the element for an added 9 mo. There was no evidence of toxicity from the arsenic in either form after 12 mo. of feeding.

In 2 human subjects the ingestion of shrimp in amounts furnishing 1,180γ and 980γ arsenic was followed by rapid and complete elimination of the arsenic. Inorganic arsenic, although excreted more slowly than shrimp arsenic, was apparently eliminated more completely than in the rat.

These results are considered to be of interest "not only for the light which they throw on the metabolism of arsenic but also as additional evidence that the manner in which inorganic elements are used in the body depends upon the source or form in which those elements are presented."

[Fluorine studies of the Tennessee Station], G. A. SHUEY (*Tennessee Sta. Rpt. 1934, pp. 20, 21*).—This progress report gives data on the fluorine content of the peel and spray residue on the peel of apples treated with various sprays and washed or not washed; and of apple flesh, peel, flesh and peel, raw cabbage, green spinach, corn meal, rye bread, whole wheat grain and flour, and wheat bran.

The vitamin A and D content of canned salmon, G. M. DEVANEY and L. K. PUTNEY (*Jour. Home Econ., 27 (1935), No. 10, pp. 658–662*).—In continuation of previous studies (E. S. R., 73, p. 732), the vitamin A and D content was determined of from 2 to 4 brands each of commercial canned chum, pink, red, and Chinook salmon by a modified form of the method of Sherman and Munsell (E. S. R., 54, p. 89) for vitamin A and by the usual line test technic for vitamin D. The modified diet for vitamin A determination consisted of vitamin A-free casein 18 percent, irradiated yeast 5, untreated yeast 5, Osborne and Mendel salt mixture 4, sodium chloride 1, hydrogenated vegetable fat 10, and starch 57 percent. The salmon was purchased in retail stores and was prepared for the feeding tests in a manner similar to that used for home consumption. The price of the canned salmon increased in the order named above. The results were as follows:

Vitamin A tests on 2 brands of chum gave values of 0.25 and 0.3 international units per gram, pink 1 unit each, red 2.5 and 4 units, and Chinook 4 and 8 units. Vitamin D tests on 2 brands of chum gave values of 1.9 and 2.6 units per gram, on 4 brands of pink 4, 6.2, 7.1, and 7.6 units, on 1 brand of red 8 units, and on 3 brands of Chinook 2.1, 2.6, and 3.9 units. The two brands of chum were about equal in vitamin D potency to 2 brands of Chinook but lower than that of the third brand.

It is noted that "canned salmon is a relatively inexpensive source of excellent protein. The fact that certain varieties of salmon are rich in vitamin A and that all varieties contain considerable vitamin D gives added significance to the place of this food in the diet, especially the low-cost diet."

The effect of quantitative underfeeding and of vitamin A deficiency on the tissue lipids of rats fed diets low in cholesterol, H. L. GILLUM and R. OKEY (*Jour. Nutr., 11 (1936), No 4, pp. 303–308*).—Analyses are reported of the lipid constituents of the readily separable tissues of three groups of eight rats each which had been kept for 70 days after weaning on a low sterol basal diet (1) ad libitum, with yeast supplement and cod-liver oil heated to destroy vitamin A; (2) limited in quantity to that eaten by the A-deficient group, but with adequate vitamin supplements, and (3) ad libitum, with adequate vitamin supplements.

"The percentages of lipid constituents found varied rather markedly from tissue to tissue, but apart from neutral fat the differences observed in the lipid constituents of the individual tissues when considered with relation to the nutritional state of the animals were slight, occasionally inconsistent, but generally in the direction to be expected from earlier work on tissue lipids in undernutrition. There was no clear evidence of a specific effect of A deficiency."

The effect of quantitative underfeeding and of vitamin A deficiency on the liver lipids of rats fed diets with added cholesterol, H. L. GILLUM and R. OKEY (*Jour. Nutr., 11 (1936), No. 4, pp. 309–317, figs. 3*).—In this study the basal diet and plan of feeding were the same as reported in the paper noted above, with the exception that for approximately half of the animals in each group 1 percent of cholesterol was added to the diet when the rats were 6 weeks of age. After about 50 days of cholesterol feeding all of the animals were killed and their livers analyzed for lipids.

The size of the livers and their fatty acid content were less for the undernourished and A-deficient animals, both with and without cholesterol, than for the controls. Although variations in free cholesterol in the liver on the different diets without added cholesterol were slight, and undernourished animals showed a tendency toward a slightly higher concentration of free cholesterol. In the cholesterol-fed animals the livers of the vitamin A-deficient group had a lower concentration and a lower absolute quantity of ester storage than the other group, but poor assimilation is suggested as the cause rather than a specific effect such as previously observed in vitamin B deficiency. The cholesterol-fed animals also had a slightly lower phospholipid content. The relatively small livers of the undernourished animals contained a higher concentration and almost as high an absolute amount of cholesterol ester as the grossly enlarged livers of the controls.

Vitamin A and carotene.—XXI, The elimination of vitamin A from the livers of rats previously given massive doses of vitamin A concentrate, A. W. DAVIES and T. MOORE (*Biochem. Jour., 29 (1935), No. 1, pp. 147–150, fig. 1*).—In continuing their studies on high concentrations of vitamin A in the livers of rats, previously noted (E. S. R., 73, p. 419), the authors presented data showing the rate at which the liver reserves of vitamin A are used.

Adult rats receiving large doses of vitamin A concentrate stored in their livers an average of 18,000 B. u. per gram of liver, representing a supply sufficient to satisfy the theoretical requirement of the rat for about 100 yr. if used at the rate corresponding to the minimum physiological requirements. When these rats were put on a vitamin A low diet, a rapid depletion of the vitamin resulted in 12 weeks, after which there appeared to be no further fall of the liver reserve.

Quantitative experiments on the occurrence of vitamin B in organs, J. R. BRODIE and F. L. MACLEOD (*Jour. Nutr., 10 (1935), No. 2, pp. 179–186, figs. 2*).—The distribution of vitamin B in the bodies of rats reared on diets containing different amounts of the vitamin was studied by feeding their tissues as the sole source of the vitamin to depleted rats.

In the bodies of the rats reared on Sherman diet B, the liver contained the largest amount of the vitamin, followed closely by the heart. Kidney tissue contained about one-half and brain tissue about one-third as much of the vitamin per gram of tissue, while blood, spleen, and lungs in the amounts fed showed only traces.

Of the rats receiving as the sole source of vitamin B tissues from rats fed for 1 mo. on a diet lacking in vitamin B, only those receiving brain tissue lived longer than the controls, but lost weight rapidly. Rats receiving the tissues of other animals fed for 1 mo. on diet B supplemented with extra yeast showed increased storage of vitamin B in some of their tissues, particularly the muscle, liver, kidney, brain, and lung.

It is concluded that the storage of vitamin B in the body of the rat may be changed within certain limits by varying the amount of this vitamin in the diet.

The occurrence of cataract in rats fed on diets deficient in vitamin B_2, M. C. BOURNE and M. A. PYKE (*Biochem. Jour., 29 (1935), No. 8 pp. 1865–1871*).—The experiments of Day and associates in which cataract was regularly produced in rats on a diet deficient in vitamin B_2 (E. S. R., 72, p. 730) have been repeated, with results differing from those of Day et al. in two respects. The incidence of cataract was much lower, and dermatitis was a much more consistent symptom of the B_2 deficiency than cataract.

In a small group of rats receiving cystine as a supplement to the basal diet no cataract developed, but in view of the low incidence of cataract in the animals not receiving cystine no importance could be attached to the negative results. The substitution of rice for cornstarch did not alter appreciably the incidence of cataract.

The authors conclude that "the relationship of cataract to vitamin B_2 deficiency still remains obscure. The results of our experiments suggest that some dietary factor may be concerned in the production of cataract, but whether this factor is the whole of the vitamin B_2 complex or some component of it, or whether it is some new and unrecognized substance, is not yet established."

Skin lesions of the rat associated with the vitamin B complex, L. R. RICHARDSON and A. G. HOGAN (*Missouri Sta. Res. Bul. 241 (1936), pp. 36, pl. 1, figs. 4*).—This is a detailed report of an extension of the studies differentiating the denuded condition and the dermatitis brought about in rats by a deficiency of different factors of the vitamin B complex (E. S. R., 75, p. 727).

Complete directions are given for the preparation of the various supplements tested. The vitamin B (B_1) carrier to supplement the vitamin B complex-free basal diet was prepared by irradiating in solution a water extract of dried brewer's yeast. Preliminary experiments showed that if this extract was ir-

radiated in a dry state from 50 to 60 percent of the antineuritic vitamin (B_1) and from 75 to 85 percent of the antidermatitis vitamin were destroyed, while if irradiated in solution over 90 percent of the antineuritic and less than 10 percent of the antidermatitis vitamin were destroyed. The method of irradiation is described in detail.

The flavine concentrate was prepared by a modification of the method of Kuhn et al., with final purification as described by Stare (see p. 889). An oil was prepared from cornstarch by extracting the starch with hot 95-percent ethyl alcohol, removing the alcohol by distillation under reduced pressure, extracting the residue with ethyl ether, and removing the ether by evaporation. Wheat germ oil was prepared by extracting the germ with U. S. P. ethyl ether and evaporating off the solvent.

In attempts to identify the antidermatitis factor, the possibility suggested by the effectiveness of cornstarch oil that the active agent might be one of the unsaturated fatty acids was tested by examining a number of vegetable oils and also cod-liver oil for effectiveness as a curative agent for the dermatitis. Wheat germ oil proved very effective, but corn oil, flaxseed oil, walnut oil, and cod-liver oil were ineffective or only slightly effective. More direct evidence that the antidermatitis agent is not a fatty acid was obtained by extracting yeast thoroughly with ethyl ether and testing both the extract and the residue. The extract proved completely inactive, while the yeast residue had lost none of its activity. Although the antidermatitis factor is contained in some oils, the authors "regard it as a water-soluble vitamin because of its presence in a water extract of yeast and in tikitiki. Our tentative hypothesis assumes that the vitamin is coupled with some other constituents of the oil, though as yet we have been unable to effect a complete separation."

The differentiation of two types of lesions was shown experimentally by denuding rats on the basal ration supplemented with tikitiki and by inducing a symmetrical dermatitis on the basal ration supplemented with the irradiated yeast extract and flavine. The denuded condition was cured by the addition of the flavine concentrate and not by the wheat germ oil. The dermatitis was healed by the wheat germ oil but not by flavine. The animals made satisfactory gains in weight when the flavine concentrate was added to the tikitiki supplement and when both wheat germ oil and flavine concentrate were added to the irradiated yeast extract supplement. Further data showed that a combination of vitamin B_1 crystals, wheat germ oil, and flavine was not adequate for normal growth of the rats and that it was inferior to tikitiki and flavine. This evidence, according to the authors, indicated strongly though not conclusively that a fourth factor was required for normal growth. When the Smith and Hendrick and the Goldberger "rat pellagra" diets were fed to rats with dermatitis and to rats with the denuded condition, the dermatitis was healed but not the denuding. When these diets were supplemented with 2 mg of flavine, the denuded condition was healed. The evidence indicated that in the rations used by earlier workers flavine was the limiting factor.

The antidermatitis factor was adsorbed on English fuller's earth from aqueous solution of tikitiki at pH 4.8 and only partially adsorbed when the solution was strongly acid. It was also adsorbed on charcoal in both neutral and acid solutions. It was unstable to heat, since autoclaving at a neutral or slightly acid reaction reduced the activity of yeast approximately 60 percent. The vitamin was dialyzed through parchment paper. The activity of the antidermatitis factor was only slightly reduced in wheat germ oil, tikitiki, and the water extract of yeast by exposure to a 1,500-w Mazda bulb for 10 hr. at a distance of 6 in. The unit for the antidermatitis vitamin proposed is the "daily dose re-

quired to heal the dermatitis in 50 percent or more of the rats when the symptoms are definitely positive but not unduly severe."

In an extensive discussion the authors attempt to correlate their observations with those of other workers. Some of the discrepancies pointed out are differences in the method of irradiating yeast, in the sources and levels at which the vitamin B carriers were fed, in the method of estimating the amount of the antineuritic vitamin in the vitamin B preparations, and in the constituents of the basal ration, some of which may contain the antidermatitis factor. Concerning the composition of the vitamin B complex and the designation of its different factors, the following statement is made:

"There are certainly three members of the vitamin B complex that are required by the rat: (1) The antineuritic vitamin, B in our terminology; (2) vitamin G which we regard as flavine, designated by us as the antidenuding factor; (3) the antidermatitis vitamin (provisionally designated as H); (4) a fourth as yet unrecognized. The fourth is assumed because the three mentioned do not permit a normal growth rate, and do not permit the rats to attain normal mature weights. If there is more than one type of dermatitis it will be necessary to add a fifth."

Pathological skin changes in the tail of the albino rat on a diet deficient in vitamin G, S. G. SMITH and D. H. SPRUNT (*Jour. Nutr., 10 (1935), No. 5, pp. 481–492, figs. 6*).—Earlier findings (E. S. R., 69, p. 472) were confirmed, and it was further shown that the changes were independent of the initial age of the rat and the season of the year. However, similar changes occurred to some extent in rats suffering from a deficiency of vitamin A or vitamin B. There were no appreciable changes in rats on the Steenbock rickets-producing diet.

The authors suggest three possible explanations for the pathological changes observed: "(1) They may be due to chronic inanition, (2) in the case of the vitamin A and vitamin B deficiencies there may be a secondary shortage of vitamin G due to inanition or faulty absorption, (3) vitamins A, B, and G may all be necessary for the protection of the tissues involved. Under these circumstances the pathological changes described may occur when any one of them is lacking."

What is vitamin G?—A survey of the literature, H. E. MUNSELL (*Jour. Home Econ., 28 (1936), No. 5, pp. 320–328*).—This critical review of the literature from 1926 to 1935 on the differentiation of the vitamin B complex with special reference to vitamin G (B_2) closes with the following summary:

"The literature indicates that if at the present time we use the term 'vitamin G' we must consider two factors—(1) flavines and (2) a still unidentified factor vitamin B_6 essential to prevent and cure a condition in rats closely resembling pellagra in man. Both of these factors are, however, distinct from the P–P factor of Goldberger and associates and probably also from the chick antipellagra factor of Elvehjem and coworkers.

"In reading reports on vitamin G, consideration should be given to the fact that the term vitamin G as used by different investigators does not always designate the same value, necessitating caution in interpretation of the results reported. In much of the assay work the term actually covers flavine values only, although in most cases this must be determined by the reader, since it is not so stated. In a few studies it is used to refer to the antipellagra factor, while in still others where the author used it synonymously with the antipellagra factor he was really dealing with the flavine factor only.

"The significance of the two factors, flavine and vitamin B_6, in human nutrition is at present unknown. Inasmuch as many of the vitamin G values given in the literature have been determined by methods giving flavine values only, it follows

that they are of little use in planning diets until we know more of the role of flavines in human nutrition."

Standard methods of vitamin D bio-assay of milk, E. M. NELSON ET AL. (*Amer. Pub. Health Assoc. Yearbook, 1935–36, p. 64*).—In this report the topics to be studied for the development of a standard method for the bio-assay of vitamin D in milk were noted. They were duration of the test period, method of feeding the milk, suitability of basal diets for control animals, methods of preserving the milk during the period of test, and the suitability of a reference oil as a standard for comparison.

An essential dietary factor found in yeast and liver extract distinct from vitamins B_1, B_2, B_6, and flavins, C. A. ELVEHJEM, C. J. KOEHN, JR, and J. J. OLESON (*Jour. Biol. Chem., 114 (1936), No. 1, pp. XXXI, XXXII*).—In this investigation at the Wisconsin Experiment Station, rats failed to grow and died in from 4 to 8 weeks without gross symptoms on a diet of highly purified casein, dextrin or sucrose, butter or cottonseed oil, salts, cod-liver oil, and vitamin B_1 concentrate. The addition of B_2 concentrate, or a flavine preparation, or a combination of the two prepared from liver extract, did not improve the growth in rats. The 5-percent original liver extract produced a phenomenal growth response. The diets supplemented with 12 percent of white corn, 2 percent of liver extract, or 4 percent of baker's yeast gave equal growth responses. This factor was present in the alcohol-ether precipitate of liver extract and was destroyed by autoclaying.

Effects on three types of animals of injecting the new factor curative of pellagra-like symptoms due to egg white, J. G. LEASE, E. KELLY, and H. T. PARSONS (*Jour Biol. Chem., 114 (1936), No. 1, p. LXI*).—In this study at the Wisconsin Experiment Station, a water-soluble factor prepared by digesting liver residue with papain and reextracting the dried extract with methanol was found to cure a severe dermatitis and a nerve disorder caused by dietary egg white in three types of animals. The curative dose for the rat was 0.25 cc given intraperitoneally 3 times a week, for the chick 0.5 cc injected 3 times a week, and for the rabbit 4 cc a day. This factor was not identical with vitamins B_1 or B_2.

The preparation and nutritional value of hepatoflavin, F. J. STARE (*Jour. Biol. Chem., 111 (1935), No. 3, pp. 567–575, figs. 3*).—A method is described in which the procedure for preparing hepatoflavine concentrate from horse liver is considerably shortened. Crystalline flavine was prepared from the concentrate by slow crystallization. When flavine alone was fed to rats and chicks on a diet deficient in vitamin B_2 a pellagra-like dermatitis developed, which was cured by a supplementary substance present in the liver and not adsorbed by fuller's earth. Both the flavine and the unknown factor were necessary for normal growth.

Hepatoflavin and pernicious anemia, F. J. STARE and L. D. THOMPSON (*Soc. Expt. Biol. and Med. Proc., 33 (1935), No. 1, pp. 64, 65*).—Purified hepatoflavine was found to give negative results when substituted for liver extract in the treatment by intramuscular injection of five patients with pernicious anemia. Further proof of the nonidentity of flavine with the factor in Lilly liver extract effective in pernicious anemia was afforded by the observation that the liver extract lost none of its activity following irradiation in 10-percent NaOH solution for 24 hr. with a 300-w light bulb, a process known to change flavine into inactive photoflavine.

Observations on the anemia caused by deaminized casein, A. G. HOGAN and R. E. GUERRANT (*Jour. Biol. Chem., 114 (1936), No. 1, pp. LI, LII*).—Further studies (E. S. R., 72, p. 892) at the Missouri Experiment Station indicated that

lactalbumin was ineffective and that commercial dried ovalbumin and dried yeast at 18 percent levels were effective in curing anemia caused by deaminized casein. Autoclaving yeast or casein caused a loss of the antianemic activity. Hydrolysis with strong acids caused a loss in casein. Between 2.5 and 5 percent of casein was required for preventing anemia when the ration contained 10 percent deaminized casein. A minimum of from 5 to 10 percent deaminized casein was required to produce anemia. Milk, egg yolk, water extract of yeast, wheat germ oil, and a number of animal tissues showed no curative action in amounts of from 100 to 400 mg daily.

Some observations on diet and dental disease, R. A. FERGUSON (*Jour. Amer. Dental Assoc., 22 (1935), No. 3, pp. 392–401*).—The results recorded from dental examinations of 4,602 white recruits from various sections of the country entering the U. S. Navy showed that those from rural districts had fewer defective teeth than those from industrial and densely populated centers. The number of defective teeth, including extractions, was highest among boys coming from New England and the Middle Atlantic States and lowest among those coming from the South and West. Perfect teeth were shown by 372 boys from the country as against 30 from the city. The beneficial effects of the sun's rays and of the diet consisting of eggs, milk, fruits, vegetables, and meat on the boys from rural sections are given in explanation of the results. An extensive review is given of the literature on the effects of diet on dental health.

TEXTILES AND CLOTHING

Oxidation of wool: Photochemical oxidation, A. L. SMITH and M. HARRIS (*Jour. Res. Natl. Bur. Standards [U. S.], 17 (1936), No. 1, pp. 97–100, fig. 1*).—The photochemical decomposition of wool, as evidenced by decrease in cystine content and increase in alkali solubility, ammonia nitrogen, and sulfate sulfur, was observed to be accelerated by acids and decelerated by alkalies. The extent to which wool is degraded during irradiation is directly proportional to the decrease in cystine content and to the increase in alkali solubility. The sulfur content of untreated and of acid-treated wool decreased during irradiation. The data suggested that part of the sulfur in wool is converted to hydrogen sulfide, some of which is subsequently oxidized to sulfuric acid.

The influence of fibre length on the milling properties of merino wool, J. B. SPEAKMAN and T. SUN, (*Jour. Textile Inst., 27 (1936), No. 6, pp. T171–T176, figs. 2*).—For yarns of the same count and twist, the rate of milling shrinkage was found to decrease with increasing fiber length in the case of Australian 64's merino wool. This result, contrary to that observed with Wensleydale wool, is due in part at least to the greater crimpiness and scaliness of merino wool fibers.

When yarns of the same strength and count were compared, simple relationships between fiber length and milling properties could not be deduced for merino wool. In most cases the short wool again was superior but with exceptions. Evidently the relationship between fiber length and milling properties is a complex function of yarn as well as fiber characteristics.

Quality guides in buying women's cloth coats, C. L. SCOTT (*U. S. Dept. Agr. Leaflet 117 (1936), pp. 8*).—This leaflet of the series noted previously (E. S. R., 73, p. 573) contains practical advice on types of coat suitable for various purposes and special qualities to consider in coat fabric, linings and interlinings, workmanship and pressing, fur and other trimmings, and fastenings.

HOME MANAGEMENT AND EQUIPMENT

Family finance: A study in the economics of consumption, H. F. BIGELOW (*Chicago: J. B. Lippincott Co., 1936, pp. XI+519, [figs. 7]*).—"Family Finance is a study in the economics of consumption, written from the point of view of the individual family." Its purposes are "to suggest in considerable detail methods and devices by which the individual family may immediately go about improving its way of living. And since we can solve our personal problems only if we become intelligently aware of the social and economic situation outside the home, a second purpose is to help families develop a point of view and work out a technic of planning and management which will facilitate continuous and satisfactory adjustment to the constantly changing conditions in the world around them."

Parts 1 to 3 discuss the modern American family; its wants and income: the importance of choice in the American economy; the satisfaction of wants by wise purchasing, production for use in the home, and cooperative and collective spending; and some problems of family finances—food, clothing, housing, household operation, the automobile, and health, education, and recreation. Part 4, the strategy of family finance, includes chapters on family budgeting in theory and practice, the long-time plan, adjusting family expenditures to changes in family needs, adjusting family expenditures to changing business conditions, the place of credit in family finance, and providing for the future.

Changes in standards of consumption during a depression, I. H. GROSS and J. POND (*Michigan Sta. Spec. Bul. 274 (1936), pp. 30, figs. 2*).—Standards and levels of consumption of a small section of the farm population in Michigan in 1929 and 1932 were compared from schedules collected by one investigator in 1932 from 114 families living on owner-operated farms in Clinton County, Mich., where the type of farming was diversified. The families, all of whom were living on the same farms during both years of the study, averaged 4.4 persons. The average size of the farms in 1929 was 113 acres, valued for tax assessment at $6,211 and in 1932 practically the same acreage, with an assessed value of $5,606. In 1929 the average cash income available for living was $1,389, with only one below $500, one above $5,000, and about two-thirds $1,000 and above. In 1932 the average cash income was $664, with the incomes of 46 families below $500, none above $2,000, and 90 percent below $1,000.

The consumption of food during the 2 yr. was estimated both in quantities produced and purchased and in cost with 1932 prices adjusted to 1929 levels. The total changes in consumption of food were relatively slight, the amounts increasing by an average of 1.8 percent and the adjusted retail valuation by 2.5 percent. The proportion of purchased food shifted from 16.3 percent of the total in 1929 to 13.6 percent in 1932. The principal increases in home production of foods were in baked goods, cottage cheese, milk and cream, and vegetables. Less fruit, both purchased and home produced, was used in 1932 than 1929. The decrease in home-produced fruits was attributed to a poor apple crop in 1932. Many families stated that they "lived better" in 1932 than in 1929 because the prices obtainable for farm produce were so low that they preferred to eat the food themselves rather than sacrifice it on the market. This is also illustrated by the changes in money value of foods adjusted to 1929 levels. The money value of purchased foods in 1932 was 6 percent less than in 1929 and the calculated money value of home-produced foods was 6 percent more. The total money value of all foods in 1932 was $965.95 compared with $942.17 in 1929, or an increase of 2.5 percent.

The total expenditures for clothing per family changed from $146.29 in 1929 to $74.10 (or $97.88 adjusted to 1929 levels) in 1932. The highest percentage

decreases in clothing expenditures were for the sons and daughters from 18 to 23 yr. of age, the percentage decreases being 46.2 and 52.5 percent. The absolute expenditures for this age group, however, were higher than for any other. Practices of renovating and making over garments, particularly dresses, coats, and overcoats, increased markedly.

The houses in the present study represented a rather superior group as compared with the average for Michigan homes in the 1934 Federal survey and also for Iowa homes in the same survey as noted in Iowa Station Research Bulletin 174 (E. S. R., 72, p. 557). Expenditures for repairs and improvements in housing decreased in 1932 by 59 percent. Additions and replacements in house furnishings were both at a lower level than in 1929.

In household operation 51 percent more families used wood in place of coal for heating and 7.5 percent more for cooking in 1932 than in 1929. There were no mechanical refrigerators in either year, but as the initial cost of electrification had decreased during the period there was an increase in the use of electricity for lighting and various types of household equipment amounting to 31 percent for washing machines, 35 percent for electric irons, and 13 percent for vacuum cleaners.

There was an increase in unpaid taxes and nonpayment of interest in mortgages and a decrease in the number of life insurances carried. In general the most important changes are summarized as follows:

"First changes made consciously by families were predominantly in increase of home production of food and purchase of cheaper foods, in curtailing of clothing expenditures, in less use of car, in fewer entertainments, and removing the telephone. An actual important change was in the nonpayment of financial obligations, although that was not listed as a conscious choice."

The methods by which the housekeeping activities are carried on in the home of the married woman who works full time outside the home (*Rhode Island Sta. Rpt. [1935], pp. 30, 31*).—This progress report summarizes some of the findings in the analysis of 44 records obtained from married women in different parts of the State engaged in full-time outside occupations. Reasons for the work, types of work, and the nature of the help in the housework are included.

Some factors affecting improvement in Iowa farm family housing, M. G. REID (*Iowa Sta. Bul. 349 (1936). pp. 323–361, figs. 10*).—The author reports the results of two housing surveys, one made in 1934 including 18,789 farm dwellings, and the other made in 1935 including 8,798 dwellings in Iowa towns and villages of less than 2,500 population.

Factors discussed are income, tenancy, cost of materials, labor costs, tax on dwellings, credit for dwelling improvement, electricity, and legislation.

A study of ovens used for domestic cooking purposes (*Indiana Sta. Rpt. 1935, p. 43*).—In this progress report thermal efficiencies are given for a gas range oven used with manufactured gas, the same range oven with a bottled gas and conversion burners, and the oven of a range designed for use with the bottled gas. Information is also given on the relative efficiencies of the ovens in preheating, maintaining the temperature during baking, and temperature variations in different parts of the oven.

MISCELLANEOUS

Atlas of American agriculture: Physical basis, including land relief, climate, soils, and natural vegetation of the United States (*U. S. Dept. Agr., 1936, pp. [231], pls. 8, figs. 373*).—This publication, prepared under the super-

vision of O. E. Baker, includes the following: Land Relief, by F. J. Marschner, noted on page 749; Temperature, Sunshine, and Wind, by J. B. Kincer (E. S. R., 61, p. 313); Frost and the Growing Season, by W. G. Reed (E. S. R., 40, p. 209); Precipitation and Humidity, by J. B. Kincer (E. S. R., 49, p. 313); Soils of the United States, by C. F. Marbut (E. S. R., 74, p. 304); and Natural Vegetation, by H. L. Shantz and R. Zon (E. S. R., 52, p. 520).

Alaska Agricultural College and School of Mines Agricultural Experiment Station, College, Alaska, 1934: Progress report, January–December, G. W. GASSER (*Alaska Col. Sta. Bul. 4 [1935], pp. 51, figs. 16*).—The experimental work reported is for the most part noted elsewhere in this issue. Meteorological data are also included.

Forty-eighth Annual Report of [Indiana Station], 1935, J. H. SKINNER and H. J. REED (*Indiana Sta. Rpt. 1935, pp. 90, figs. 29*).—The experimental work not previously referred to is for the most part abstracted elsewhere in this issue.

Report of Moses Fell Annex Farm, Bedford, Indiana, June 1936, H. J. REED and H. G. HALL (*Indiana Sta. Circ. 219 (1936), pp. 16, figs. 8*).—The experimental work summarized is for the most part abstracted elsewhere in this issue.

Report of the Puerto Rico Agricultural Experiment Station, 1935, [A. LEE] (*Puerto Rico Sta. Rpt., 1935, pp. [2]+34, figs. 15*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. The general agricultural situation in Puerto Rico and the activities there of bureaus of the U. S. Department of Agriculture are also discussed.

Forty-eighth Annual Report [of Rhode Island Station, 1935], B. E. GILBERT (*Rhode Island Sta. Rpt. [1935], pp. 40*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Meteorological data (pp. 38, 39) are also included.

Forty-seventh Annual Report [of Tennessee Station], 1934, [C. A. MOOERS ET AL.] (*Tennessee Sta. Rpt. 1934, pp. 39*).—The experimental work reported is for the most part noted elsewhere in this issue.

Michigan Agricultural Experiment Station Quarterly Bulletin, [May 1936], edited by V. R. GARDNER and A. A. APPLEGATE (*Michigan Sta. Quart. Bul., 18 (1936), No. 4, pp. 209–278, figs. 7*).—In addition to the usual abstracts of bulletins and journal articles, this number contains articles abstracted elsewhere in this issue and the following: Field Peas Offer Possibilities as a Summer-Seeded Green Manure, by H. R. Pettigrove (pp. 263–265), and Distribution of Red and White Wheat in Michigan, by H. C. Rather (pp. 266–268).

Annual summary of publications, B. C. PITTMAN (*Utah Sta. Circ. 108 (1936), pp. [4]*).—Abstracts of Bulletins 257–271 and Circular 107 are given, with lists of reprints and leaflets.

In memory of Charles Embree Thorne, 1846–1936 (*Ohio Sta. Admin. Circ. 3 [1936, pp. 14], figs. 3*).—This includes an account of Dr. Thorne's contribution to agricultural research, by A. Vivian, and a number of tributes (E. S. R., 74, p. 577).

NOTES

Colorado College and Station.—L. D. Crain retired September 1 as head of the department of mechanical engineering and vice director of the station, but is continuing as building superintendent. Robert E. Trimble, meteorologist in the division of irrigation investigations for 45 years, retired July 1 and has been succeeded by H. O. Caperton. Melvin S. Morris, associate in range management, resigned September 1 to accept a similar position in the University of Montana and has been succeeded by Terrill D. Stevens as assistant professor and assistant in range and pasture management. Hazen B. Pingrey, assistant in rural economics, resigned August 1 to become assistant agricultural economist in the New Mexico Station. Recent appointments include Dr. H. S. Wilgus, Jr., on July 1, as head of a new section of poultry and Dr. Ralph Weihing, instructor in agronomy and assistant agronomist in the Washington College and Station, as assistant in plant industry.

Georgia University.—*Science* notes that the Georgia Rehabilitation Corporation has deeded to the university a tract of 1,900 acres of land estimated to be worth about $50,000. It is announced that the College of Agriculture and the George Foster Peabody School of Forestry will use the land for experimental purposes.

Illinois University and Station.—Ruth A. Wardall, head of the department of home economics since 1921, died July 15. Miss Wardall was a native of Illinois and a graduate of the university in 1903 and received the M. A. degree in 1907. She was a pioneer worker in home economics, heading the department in the South Dakota College from 1903 to 1906, the Ohio State University from 1907 to 1913, and the University of Iowa from 1913 to 1921. She had long been active in the home economics section of the Association of Land-Grant Colleges and Universities, and was joint author with Edna N. White of A Study of Foods (1914) and with C. W. Taber of Economics of the Family (1923). On September 1 the vacancy caused by her death was filled by the appointment of Lita Bane.

Dr. L. J. Norton has resumed his duties as professor of agricultural economics after 18 months' leave as vice president of the Production Credit Corporation of St. Louis and will be associated with research as well as teaching and extension.

Missouri University and Station.—An additional wing to the home economics building has been completed and equipped, practically doubling the amount of space available for this subject.

Two new greenhouses have been built. One of these, given over to experiments in plant genetics, is equipped with artificial lights in order to regulate conditions during cloudy weather and short winter days. The other greenhouse will be used to study the effect of temperature on the important grasses of the State, both soil and air temperatures being subject to control.

Dr. John Milton Poehlman has been appointed instructor in field crops.

New Mexico College and Station.—The station recently began work on a Bankhead-Jones project entitled Studies of the Revegetation of Southwestern Ranges by Controlled Grazing, Utilization of Run-off Water, and Reseeding. Under this project studies are also being conducted in connection with the determination of the carrying capacity of southwestern ranges. A laboratory has been fitted up at the headquarters of the livestock ranch controlled by the

college, and equipment has been installed for determining soil moisture, making germination tests of seeds, and recording precipitation and temperature data.

A new home economics building costing with equipment over $64,000 has been completed.

Dr. Ray Fife, State director of agricultural education in Ohio, has been appointed president, assuming his new duties in August. Other recent appointments include J. V. Enzie as assistant professor of horticulture and assistant horticulturist, vice Dr. A. L. Stark resigned; Dr. Kenneth W. Smith as assistant professor of animal husbandry and assistant animal husbandman; and T. R. Timm as assistant agricultural economist.

Oklahoma College and Station.—In cooperation with the U. S. D. A. Bureau of Plant Industry the station has completed the erection of a gin building and the installation of machinery for ginning foundation gin stocks as well as experimental seed plats. The building is a brick and tile structure intended to be fireproof, operated by an electric motor, and containing two gin stands, with the possibility of installing a third, as well as a drier for the drying and proper humidification of the cotton before ginning.

Appointments in the college and station since July 1 include the following as assistant professors: Adlowe L. Larson, agricultural economics; Bruce R. Taylor and Hilton M. Briggs, animal husbandry; Garth W. Volk, soils; Walther H. Ott, poultry husbandry; and Franklin A. Romshe, horticulture. W. B. Maddox has been appointed creamery superintendent.

Pennsylvania College and Station.—The resignations are noted of A. C. McIntyre as assistant professor of forest research; H. E. Longenecker, Dr. J. J. Thomas, and Dr. C. O. Jensen as instructors in agricultural and biological chemistry; M. G. Huber, D. D. Stevenson, Florence Brown, and W. I. Bull as instructors in agricultural engineering, forestry, botany, and forestry extension, respectively; E. G. Fouse and Howard J. Bonser as assistants in agricultural economics; and R. K. Ziebarth as assistant in forestry. Recent appointments include as assistant professors Dr. O. D. Burke, Dr. George F. Johnson, E. Macklin John, Walter W. Simonds, and Dr. James J. Reid in plant pathology extension, agricultural extension, agricultural economics, forestry extension, and bacteriology, respectively; as instructors Allen H. Bauer, Dr. Leita Davy, and W. S. Jeffries in plant pathology extension, agricultural and biological chemistry, and agricultural extension, respectively, and Raymond R. Moore and Joseph T. Radel in forest research; and as assistants William L. Barr in agricultural economics and Ronald A. Morck and William L. Porter in agricultural and biological chemistry.

South Dakota Station.—Dr. Kurt W. Franke, head of the department of agricultural chemistry since 1927, died September 15 at the age of 47 years. Born in St. Paul, Minn., Dr. Franke received a number of degrees from the University of Virginia and that of doctor of philosophy from the University of Minnesota in 1927. In South Dakota he began a comprehensive study of alkali disease, which in 1931 became cooperative with several bureaus of the U. S. Department of Agriculture. The results indicated the responsibility of some organic selenium compound, the isolation of which he was attempting. A recent tribute by Dr. R. A. Gortner in *Science* points out that in 9 years he "made a major contribution to agricultural science and accomplished far more than many men accomplish in a lifetime of endeavor. Twenty-two papers under his authorship had already appeared, and the experimental work on several more had been completed."

Tennessee University.—C. A. Willson, dean of the College of Agriculture and professor of animal husbandry since 1923 and associated with the institution

since 1910, died October 12 at the age of 57 years. A native of Michigan, he was the recipient from the Michigan College of the B. S. A. degree in 1906 and of the M. Agr. degree in 1923, as well as of the M. S. A. degree from the University of Missouri in 1910. He served as assistant in animal husbandry in the Kansas College and Station in 1906–7 and as instructor in animal husbandry in the University of Missouri from 1907 to 1910. He was the author of Arithmetic in Agriculture and Rural Life, the third edition of which was published in 1935.

Utah College and Station.—With the cooperation of several other agencies the station has undertaken an inventory of the agricultural resources of the State and the present extent of their utilization. The study includes soil, range, and irrigation surveys and an economic analysis of the agricultural enterprise. The inventory has been concluded for Washington and west Millard Counties, while in Utah County and the Uintah Basin it is complete in all phases except the soil survey, which is expected to be finished early in 1937.

Blanche Condit Pittman, publications editor and librarian for 20 years, resigned July 1 and has been succeeded by Gladys L. Harrison. Leaves of absence for the year have been granted to Dr. B. L. Richards, professor of botany and plant pathology, and David A. Burgoyne, secretary of the station, the duties in the latter position being assumed by F. Wilcken Fox, secretary of the bureau of visual instruction in Brigham Young University. Delmar C. Tingey, associate agronomist, has returned from 8 months' leave spent as associate agronomist with the U. S. D. A. Soil Conservation Nurseries at Pullman, Wash.

Florida Citrus Research Laboratory.—A laboratory for basic research in the biological and chemical problems of handling and processing citrus fruits and their products has been established by B. C. Skinner at Dunedin, Fla. Dr. R. B. Harvey, professor of plant physiology and botany in the Minnesota University and Station, has been granted a year's leave of absence to take charge of the laboratory, which now has a staff of four coworkers. Attention will be given to improved methods of processing, utilization of cull citrus, and other phases of citrus production and marketing.

Second International Congress for Microbiology.—This Congress was held from July 27 to August 1, 1936, at University College, London, with an attendance of over 1,000. The Congress was organized into eight sections, dealing, respectively, with the general biology of micro-organisms; the viruses and virus diseases in animals and plants; bacteria and fungi in relation to disease in man, animals, and plants; economic bacteriology, under the presidency of Dean and Director R. E. Buchanan of the Iowa College and Station; medical, veterinary, and agricultural zoology; serology and immunochemistry; microbiological chemistry; and specific immunization in the control of human and animal diseases. An invitation from the United States to hold the third congress on the Atlantic seaboard in 1939 was accepted.

Necrology.—Dr. Justus W. Folsom, associated with the entomological work of the Illinois University and Station from 1900 to 1923 and since 1925 entomologist of the field station of the U. S. D. A. Bureau of Entomology and Plant Quarantine at Tallulah, La., died September 24, aged 65 years. He was the author of Entomology With Special Reference to Its Biological and Economic Aspects (1906).

Charles Fitzhugh Talman, librarian of the U. S. D. A. Weather Bureau since 1908 and widely known for his bibliographical work, contributions to the popular press, and books of reference and other meteorological services, died July 24 at the age of 62 years.

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